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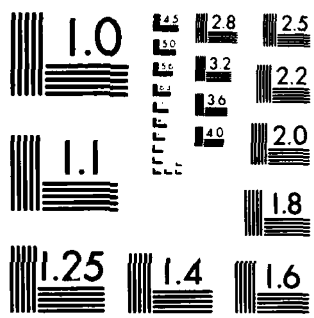

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DEVELOPMENT OF AN ORGANIZATIONAL STRUCTURE FOR THE COMBAT IDENTIFICATION SYSTEM PROGRAM OFFICE (CISPO)

Ronald P. Goldstein, Captain, USAF

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The purpose of this thesis was to propose an organizational structure for the Combat Identification System Program Office (CISPO) using contemporary organizational theory. Contingency theory supports no one particular organizational structure. Instead the theory contends that an acceptable organizational design should be based on key situational variables or factors. In the case of CISPO the chosen factors were external environment, strategy, and internal technology. The contingent factors were characterized using typologies and classification schemes that currently exist in the literature on organizational design. Interviews with the Deputy Program Director of CISPO provided the necessary data to allow a characterization of CISPO in terms of the contingent factors. A moment method was used to couple the contingent factors representing the CISPO situation to appropriate structural types. It is envisaged that the proposed structure will not be an end in itself, but that it will be modified and "fine tuned" through discussion subsequent to this thesis and will ultimately provide CISPO a viable and responsive organizational structure.

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DEVELOPMENT OF AN ORGANIZATIONAL STRUCTURE FOR THE COMBAT IDENTIFICATION SYSTEM PROGRAM OFFICE (CISPO)

A Thesis

Presented to the Faculty of the School of Systems and Logistics

of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the Requirements for the

Degree of Master of Science in Systems Management

By

Ronald P. Goldstein, BS, MA
Captain, USAF

September 1982

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has been accepted by the undersigned on behalf of the faculty of the School of Systems and Logistics in partial fulfillment of the requirements for the degree of

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CHAPTER I

INTRODUCTION

Problem Statement

The purpose of this thesis will be to identify a suitable organizational structure for the Combat Identification System Program Office (CISPO) formerly the United States Identification System Program Office (USISPO).

The impetus for this investigation comes from a direct request from the Deputy Program Director of CISPO, Lieutenant Colonel Molnar during personal interviews during August 1982, and is tied to the proposed improvements in the acquisition process.

United States Deputy Secretary of Defense Carlucci has attempted to stabilize major system acquisition programs within the Department of Defense (DOD) while revising the entire military acquisition process. Under the section entitled Acquisition Management Principles and Objectives of DOD Directive 5000.1 Mr. Carlucci states:

> To achieve stability, DOD components shall . . . develop an acquisition strategy at the inception of each major acquisition that sets forth the objectives, resources, management assumptions, extent of competition, proposed contract types, and program structures . . . and tailors the prescribed steps in the major system acquisition strategy decision-making process to this strategy. When the acquisition strategy is

approved by the DOD Component, changes shall be made only after assessment and consideration of the objectives of this Directive, and of the impact of such changes on the program [DODI 5000.1, 1982:2].

The acquisition strategy that Mr. Carlucci references in DOD Directive 5000.1 is more clearly defined in the sister document DOD Directive 5000.2:

> Acquisition strategy is the conceptual basis of the overall plan that a program manager follows in program execution. It reflects the management concepts that shall be used in directing and controlling all elements of the acquisition in response to specific goals and objectives of the program and in ensuring that the system being acquired satisfies the approved mission need. Acquisition strategy encompasses the entire acquisition process. The strategy shall be developed in sufficient detail, at the time of issuing solicitations, to permit competitive exploration of alternative system design concepts in the Concept Development Phase. Additionally, sufficient planning must be accomplished for succeeding program phases, including production, for those considerations that may have a direct influence on competition and design efforts by the contractors. The acquisition strategy shall evolve through an iterative process and become increasingly definitive in describing the interrelationship of the management, technical, business, resource, force structure, support, testing, and other aspects of the program [DODI 5000.2, 1980:9].

With the acquisition strategy firmly defined, one of the highest priorities of implementing that strategy is building an organization capable of effective strategy execution. While there is no panacea for building a strategically effective organization, the structural form and process of the organization should be closely aligned with the objectives or needs of the strategy (Thompson and Strickland, 1980). Robert Hersey and Alfred Chandler underscore the importance of proper organizational design in attainment of both long-term and short-term goals. Chandler further emphasizes that as organizations mature they continually update and establish new goals whose achievement is dependent on the appropriate organizational structure (Hutchinson, 1971).

The importance of organizational structures, according to Peter Drucker, is not that the best ones guarantee results and performance, but that the wrong ones guarantee nonperformance by producing friction and frustration. They spotlight the wrong issues, aggravating irrelevant disputes, and accenting weaknesses and defects instead of strengths. Organizational structure will not just evolve, nor is it intuitive; but it requires thinking, analysis and a systematic approach (Drucker, 1974). Kast and Rosenzweig (1979) define one of management's key functions as designing the organization in response to contextual and internal factors, and it is management that makes the strategic choices that are fundamental in the determination of the organizational structure. Hence, the organizational structure of the system program office in a major weapons system acquisition will be a major determinant of the effective implementation of the acquisition strategy, and ultimately the stability of the acquisition process.

In order that the internal and contextual factors mentioned by Kast and Rosenzweig (1979) may begin to be considered, an overview of CISPO and its environment is necessary.

CISPO: An Overview

The Combat Identification System Program Office exists on the basis of five basic documents:

1. USDRE Memorandum, 19 January 1979, Subject: IFF Development Program

2. USDRE Memorandum, 13 April 1979, Subject: FY79 Actions to Support the IFF Development Program

3. Tri-Service Charter for the Management and Administration of the United States Identification System Program, 26 September 1980

4. Joint Mission Element Need Statement for Improved Identification Capability, 30 September 1980

5. Secretary of Defense Memorandum, 30 October 1980, Subject: U.S. Identification System Program

The major idea behind this program office is summed up quite well in the Program Master Plan for CISPO:

> The objective is quite clear: To improve U.S. identification capability to the point where U.S. forces no longer are required to close on unknown targets making themselves vulnerable to enemy fire or risk fratricide by firing weapons at unidentified targets [CISPO Master Plan, 1980:iv].

CISPO was established as a Tri-Service Program with the Air Force designated as the Lead Service by the USDRE Memorandum, dated 19 January 1979. The Air Force has assigned program management responsibility for the program to the Aeronautical Systems Division (ASD), Air Force Systems Command (AFSC). A cursory examination of the CISPO Charter reveals the ambitious objectives of this organization.

> The objective of USIS Program is the development of an evolutionary improved identification capability for all applicable U.S. functions and weapon systems with worldwide operational capabilities. An important consideration in the program is interoperability with NATO and cooperative initiatives with those nations where special relationships have been established by Memoranda of Understanding (MOU). . . . The USIS Program will be planned, organized and controlled by USISPO as a Tri-Service Program. . . . A Tri-Service Executive Steering Committee will ensure that the requirements of all Services and NATO are fully considered. . . [CISPO Charter, 1980:1-2].

In addition to being tri-service in nature this program has requirements that place it in the multinational arena. These characteristics introduce the most complex acquisition environments in which a system program office can operate. Just the tri-service attributes of this program are acknowledged as being complex in that the program manager must be equally sensitive to the needs of the other services, must equitably allocate the program costs, and must meet schedule commitments of the other services. These requirements necessitate additional channels of communication not normally found in the single user program office (Wall, 1979). This added complexity is not without its positive aspects and benefits and anchors in economic reality. Dr. Malcom R. Currie, former Dierector of Defense Research and Engineering, stated:

> The time is long past when we can have the luxury (and waste) of individual Service developments for every requirement. In addition to fiscal realities, the complexities of modern systems and requirements for intimately integrated and interdependent tactics between Services dictate that we increasingly approach requirements and systems developments on a truly joint-Service basis [Oppedahl and Passi, 1979:19].

Such rationale for joint agreement is difficult to fault. Substantial cost savings should be realized by eliminating duplicative R&D, and by capitalizing on volume procurement (Oppedahl and Passi, 1979).

Couple the tri-service aspects with the requirements of Public Law 94-361, Sections 802 and 803, and the management challenge grows to even greater heights. This public law states:

> It is the policy of the United States that equipment for the use of personnel of the Armed Forces of the United States stationed in Europe under terms of the North Atlantic Treaty should be standardized or at least interoperable with the equipment of other members of the North Atlantic Treaty Organization [DOD Multinational Handbook, 1981:1-2].

Public Law 94-361 has layed the foundation for what is commonly referred to as RSI. RSI stands for rationalization, standardization, and interoperability of weapons systems developed within the North Atlantic Treaty Organization. The RSI objectives are also being pursued in other U.S. alliance situations.

The combination of these two requirements, tri-service and multinational, combine to create one of the most complex and challenging acquisition environments possible. This environment is typified by a call for maximum technical commonality of hardware under the extremely different combat conditions of the individual services, and an acquisition arena that involves different national priorities, customs, and different views about competition, defense industry practices, and personal practices (DOD Multinational Handbook, 1981; Wall, 1979).

Objectives and Assumptions

In order to maintain a sound theoretical basis while attempting to deal with the complex and challenging aspects of CISPO I am going to follow the process often suggested in Kepner and Tregoe (1969) for approaching any investigation or problem. It is important to note that the failure to follow this pattern or paradigm in a serial fashion can lead to large amounts of work being accomplished that is either nonessential, or work that doesn't contribute to the accomplishment of the stated objectives. While this paradigm can be described in a number of ways I have chosen terminology that is reflective of the purpose of this thesis.

1. Define the purpose of the organization

2. Develop concepts of operation to reach the desired purposes

3. Conduct technical and economic feasibility studies

4. Produce a detailed design and system specification

5. Implement the proposal

6. Evaluate and review the new system

This thesis will deal primarily with steps one and two since acceptance of the operational concepts is critical to the organizing process. Any attempt to progress through the paradigm without discussion and eventual acceptance of some form of operational concept or concepts would result in work being completed that lacks a logical or theoretically sound foundation. Since the time available for this thesis allows only for the development of the initial concepts of operation, I would envisage several iterations of step two of the paradigm occurring prior to the selection of the finalized concepts of operation.

Additionally, I have assumed that the appropriate Department of Defense Instructions and Memoranda as well as Air Force Regulations, Manuals, and Memoranda provide accurate representation of the viewpoints and desires of key Department of Defense, and Senior Service personnel.

In attempting to identify a suitable organizational structure for the Combat Identification System Program, I have considered it beyond the scope of this thesis to develop empirical support for any absolute measures of effectiveness and efficiency of the proposed structure. The purpose here is to attempt to integrate current organizational concepts and current organizational environments to establish a plausible organizational structure to accomplish the goals of the Combat Identification Systems Programs during the Defense System Acquisition Review Council Milestones I and II (DODI 5000.2, 1980).

While the paradigms, processes, and models used in this thesis may be modified and applied to other organizational situations with relative degrees of success, the overall organizational approach or the basic school of thought with respect to organizational design that will be used in this thesis needs to be presented.

The Contingency Approach to Organizational Design

The growing discontent with "universal" organizational techniques proposed by those such as Taylor (1919), Fayol (1949), Mooney and Reiley (1931), Weber (1947), and Gulick and Urwick (1937) fostered especially intense criticism when attempting to explain or design complex organizations. It wasn't the fact that Taylor's (1911) Four Principles of Management, or that the Fourteen Principles Fayol (1949) developed to guide management were wrong, but it was their claim that these principles were universal and equally applicable to religious, governmental, industrial, or service type organizations that brought forth the following criticism (Hutchinson, 1971; Scott and Mitchell, 1976):

1. The external environment of the organization wasn't accounted for with the same thoroughness given the internal situation of the organization. A corollary to this shortcoming was the downplay of the affect that forces external to the organization had on behavior of persons within the organization.
2. The simplistic explanations of motivation under classical theory were incomplete. Additionally, workers were assumed to be incapable of self-motivation.
3. The formal organization often failed to account for the actual accomplishments of tasks in many organizations; hence, the informal organization failed to receive recognition.
4. Classical theory didn't establish cause and effect relationships dealing with the operational portion of the organization.
5. Specialization and efficiency were overemphasized.

As a result of attempting to overcome the shortcomings of classical theory several alternative theories emerged. As with most of the modern organizational theories, contingency theory accepts the open systems model of the organization as a starting point. Whereas systems theory proposes broad and general models, contingency theory deals with specific organizations, environments, and internal subsystems (Kast and Rosenzweig, 1979; Scott and Mitchell, 1976).

The contingency approach assumes that greater efficiency, effectiveness, and participant satisfaction can be obtained through increasing the integration between the organization and its environment. This requires dynamic organizational planning and a management that

> . . . must recognize more and different kinds of goals and needs of his organization, consider more factors bearing on a decision, employ a wider variety of

> ways of making and carrying out decisions, and evaluate decisions not on a one-by-one basis, but in relation to each other. Therefore, practitioners must be made aware that they must learn new approaches to solving organizational problems. . . [Kast and Rosenzweig, 1979:115].

While Kast and Rosenzweig aptly explained the requisite attitude for its use, Szilagyi (1981:297) succintly states the objectives of the contingency approach.

> A contingency approach attempts to understand the interrelationshiops within and among organizational units as well as between the organization and its environment. It emphasizes the complex nature of organization and attempts to interpret and understand how they operate under varying conditions and in specific situations. The approach strives to aid managers by suggesting organizational design strategies which have the highest probability of succeeding in a specific situation. The success criteria revolve around the accomplishment of organizational goals.

As is readily apparent from the foregoing objectives, the contingency approach to organizational design supports no one particular design. A particular design is achieved by matching the structure to the environment and the time period within the organization's development. Personal opinions about the situations facing the organization and the use of different organizational techniques within the same organization are encouraged in contingency theory (Szilagyi, 1981).

While the number of key situational factors considered depends on the particular advocate, Wolf (1964) identified as many as twenty-two factors, I chose to use Szilagyi's (1981) groupings of factors. These groupings include external environment, strategies, and internal technologies. The specific situational factors within each of these major groupings reflect key factors similar to those espoused by many of the contingency theorists.

External Environment

This grouping is proposed, almost universally, as the most important set of influences on an organization. The certainty of the environment, or the ability to predict changes in the environment external to the firm, is a situational factor upon which Burns and Stalker (1961) grouped organizations. These groupings were mechanistic, firms which had centralized decision-making authority coupled with limited downward flow of information and a high degree of task specialization, and organic, firms characterized by interactive and dynamic task assignment.

Lawrence and Lorsch (1967) identified two key situational factors that relate to the external environment of organizations. These are differentiation, ". . . differences in goal orientation and in the formality of structure [Lawrence and Lorsch, 1967:11]," and integration,

> . . . the quality of the state of collaboration that exists among departments that are required to achieve unity of effort by the demands of the environment [Lawrence and Lorsch, 1967:11].

Using these two characteristics, Lawrence and Lorsch found that the mechanistic or functional-type of organizational structures are more suited for stable environments, while product-type or organic organizational structures are more advantageous in unstable environments.

Strategies

Management reacts not to the actual environment, but to their perception of the actual environment. Additionally, management makes choices with respect to the limits of interaction with the perceived environment, goals, conversion technologies, and climate within the organization. In short, they specify the strategies to be employed (Kast and Rosenzweig, 1979). According to Child (1972:1),

> Strategic choice extends to the context within which the organization is operating, to the standards of performance against which the pressure of economic constraints has to be evaluated, and to the design of the organization's structure itself.

This ability to opt for or choose has only recently been added to the key situational factors considered by contingency theorists (Bobbitt and Ford, 1980).

Chandler (1962), after the study of seventy of America's largest organizations, concluded that organizational structure follows the growth strategy of that organization, and that organizations don't change their strategies until forced to do so. Chandler's hypothesis that structure followed strategy was further supported by Scott in his 1971 studies (Paine and Naumes, 1975).

Internal Technologies

The view espoused by Perrow (1970) appears to have drawn a quorum of support for its definition of technology (Hrebiniak, 1978; Kast and Rosenzweig, 1979; Ovalle, 1981; Szilagyi, 1981). Kast and Rosenzweig (1979:176) summarized the Perrow view as

> . . . the organization and application of knowledge for the achievement of practical purposes. It includes physical manifestations such as tools and machines, but also intellectual techniques and processes used in solving problems and obtaining desired outcomes.

Methods of "operationalizing" technology have been numerous. Woodward (1965) established three types of production technology: small or unit batch, mass-produced or large batch and continuous-process. Hunt (1970) provided his concept of performance-oriented and problem-solving organizations. Perrow's (1970) analyzable and unanalyzable problem format provides still another attempt to categorize technologies. Thompson (1967) presented one of the more well known classifications of types of technologies. These types are: mediating, long-linked and intensive. The level of analysis of the organization may be the reason for the diversity of classification schemes.

Summary

This thesis will attempt to integrate current organizational thought in the form of contingency theory to establish a plausible organizational structure to accomplish the requirements leveled on the Combat Identification Systems Program Office during the time period of DSARC Milestones I and II.

The groupings of key situational variables to be used in my contingency approach to organizational design will be: external environment, strategies, and internal technologies. These groupings of key situational factors will be the subject of further development in the next chapter of this thesis. The third chapter will contain the initial proposed structure.

CHAPTER II

QUANTIFICATION

Introduction

In the first chapter I identified three major groups of factors that have been found to have a causal relationship with organizational structures. These groups are external environment, strategies, and internal technologies.

This chapter will define each of the major categories or groups, identify and define components within each group that will be used to operationalize that major groups of factors and, finally, establish a usable description based on the operationalized components for use in the third chapter where a preliminary model of organizational structure for CISPO will be established.

External Environment

Throughout organizational literature definitions of external environment tend to be both explicit and implicit. These definitions are usually vague and tend to identify external environment in a physical sense as anything external to the boundaries of the organization (Kast and Rosenzweig, 1979; Robey, 1982) or in a behavioral sense as a phenomenon that occurs outside the role and authority relationships that the organization uses to prescribe behavior and sanctions (Connor, 1980; Jurkovich, 1974). Either of these implies some kind of permeable boundary. The idea of a permeable boundary is essential to the open-systems approach to organizational structure. Several of the characteristics of organizational boundaries, input and output filtering, and intrusion buffering, will aid in the design of organizational structures in Chapter III.

The definition of the external environment that will be used in this thesis will be the definition presented by Jurkovich (1974:383).

> Environment is the total set of sectors outside of the organization which, in turn is a role cluster bound together by sets of rules that prescribes behavior and establishes sanctions when rules are violated. Sectors refer to those elements or units of behavior--human and nonhuman--in the environment that decision makers perceive as a relevant for the organization.

Jurkovich (1974) as well as Kast and Rosenzweig (1979), Lawrence and Lorsch (1967), Szilagyi (1981), and Thompson (1967) mention a segmentation of the external environment into components or subenvironments. These are the economic, political, social, and technological subenvironments. A further division of these subenvironments is made by Kast and Rosenzweig (1979), Robey (1982), and Thompson (1967). Based primarily on the work of Dill (1958), these authors make the further distinction by establishing the task environment.

Task environment is defined as that portion of the external environment that is directly implicated in the decision-making and transformation processes of an organization. The components of the aforementioned subenvironments that make up the task environment are customers, suppliers, regulatory agencies, competitors, and the scientific-technical community. Customers in the task environment refers to the distributors and the users of the product. Suppliers consist of those sectors of the external environment that make available raw materials, component parts, labor, equipment, work space, and financial support. Regulatory agencies refers to the socio-political aspects the organization faces. These are the regulatory controls imposed by any governmental body and public attitude toward the particular product and the industry. Competitors include competitors for supplies and customers, substitute products, and the economic framework within which the organization must function (e.g., competitive, oligopolistic, or monopoly). Finally, the scientific-technical community is the fastest changing of any of the components of the task environment. The two aspects of concern here are the innovation and the technology transfer processes. Innovation processes are the efforts to develop new technologies, processes, methods, and products.

The technology transfer process is the process by which the innovation becomes usable in the marketplace (Kast and Rosenzweig, 1979; Szilagyi, 1981; Thompson, 1967).

While the external environment may be the same for all organizations in a given society, the task environment for a specific organization will be unique (Dill, 1958).

In using task environment to establish the environmental inputs to the CISPO-proposed organization structures, one must recognize the possible limitations in such an approach. Thompson (1967:28) has revealed the importance of the remaining external environment.

> The remaining environment can be set aside for a while, but we cannot discard it for two reasons: (1) patterns of culture can and do influence organizations in important ways, and (2) the environment beyond the task environment may constitute a field into which an organization may enter at some point in the future.

An organization isn't capable of responding to all components of its environment. It is hoped that by focusing on those components of the external environment that account for most of its effect, that a reasonable representation can be made (Kast and Rosenzweig, 1979; Robey, 1982).

Jurkovich (1974) presents the typology that will be used in evaluation of the CISPO task environment. Jurkovich (1974) bases his typology on the work of Lawrence and Lorsch (1967), Thompson (1967), and Emery and Trist (1965). The matrix representing this core typology of organizational environments is shown in Figure 1. In

		General characteristics															
		Noncomplex								Complex							
		Routine				Nonroutine				Routine				Nonroutine			
		Organized		Unorganized		Organized		Unorganized		Organized		Unorganized		Organized		Unorganized	
Movement		D	I	D	I	D	I	D	I	D	I	D	I	D	I	D	I
Low change rate	Stable	1															16
	Unstable																
High change rate	Stable																
	Unstable	49															64

*D=Direct I=Indirect

Figure 1. A Core Typology of Organizational Environments (Jurkovich, 1974:381)

assessing environments or subenvironments the matrix focuses on six major factors of that environment: (1) complexity, (2) routineness, (3) the presence of organized sectors in the environment, (4) the organization of these sectors, (5) the rate of change of the environment, and (6) the stability of that change rate.

Complexity, as used in the typology matrix, refers to whether or not the decision makers of an organization think that their environment is complex or not. Jurkovich (1974:383) chooses this representation since he is of the opinion that "any inductively derived definition of complexity results in a very abstract statement that is either too vague or too trivial or both." Kast and Rosenzweig (1979) also state that the perception of an organization's environment may account for some of the variation in organizations that share a similar environment.

The routineness of the environment is characterized by the requirement to change current operations so that a problem may be solved or an opportunity may be exploited. Jurkovich's (1974:383-384) description of routiness from an information viewpoint is also informative.

> The degree of routineness and nonroutineness might also be determined by the state of the information problems. These problems can take three forms: people complain that (a) they cannot gain access to critical information, (b) they cannot trust a significant portion of the information, or (c) the set of information categories they need for decision making is uncertain.

The higher the percentage of members with information problems and the more severe those problems, the more nonroutine the problem-opportunity state is.

An organized sector or group of sectors refers to an environment where most interaction is accomplished between sectors, organizations, with formal sets of rules governing their behavior and goals that are explicitly stated. Information about these sectors is usually available at set intervals of time. An unorganized sector refers to portions of the environment that utilize the products of the organization but are not bound by any formal or informal rules of interaction. Certainty of the exchange process is the major concern. The term indirect refers to the use of an intermediary organization to deal with a particular subenvironment. Direct implies that the organization in question attempts to directly confront that particular subenvironment (Jurkovich, 1974).

The final component of the typology matrix deals with the rate of change of the external environment as reflected in the number of changes in the goals of the organization per unit of time. The stability refers to the consistency or dynamic character of the rate of change of the external environment. Again, these characteristics are perceived in nature (Jurkovich, 1974).

In the next section the typology matrix will be used to classify the five subenvironments that constitute the task environment of the Combat Identification System Program.

CISPO Task Environment

Lawrence and Lorsch (1967:209) state,

> . . . the environment with which a major department engages is decided by the key strategic choice, "What business are we in?" Once that decision is made, whether explicitly or implicitly, the attributes of the chosen environment can be analyzed.

Such a statement is especially applicable in the case of CISPO. The total environment defined in the organization's charter is all-encompassing as shown in Figure 2.

Figure 2 depicts the entire gamut of the CISPO charter. The Combat Identification System (CIS) can be broken into two major conceptual areas. The first is the area of direct identification which involves the user of the CIS and the target, or that entity that the CIS user wishes to identify; and the second is the indirect area of CIS. The indirect portion involves the user, the target, and a third party (i.e., ground radar, aircraft spotter, ground unit in the area, etc.). Work conducted in the indirect area associated with CIS is being carried out independently by the all-service laboratories.

The area of direct identification is further broken into cooperative and noncooperative processes. Cooperative identification deals with those methods relying primarily on the use of an interrogator and receiver.

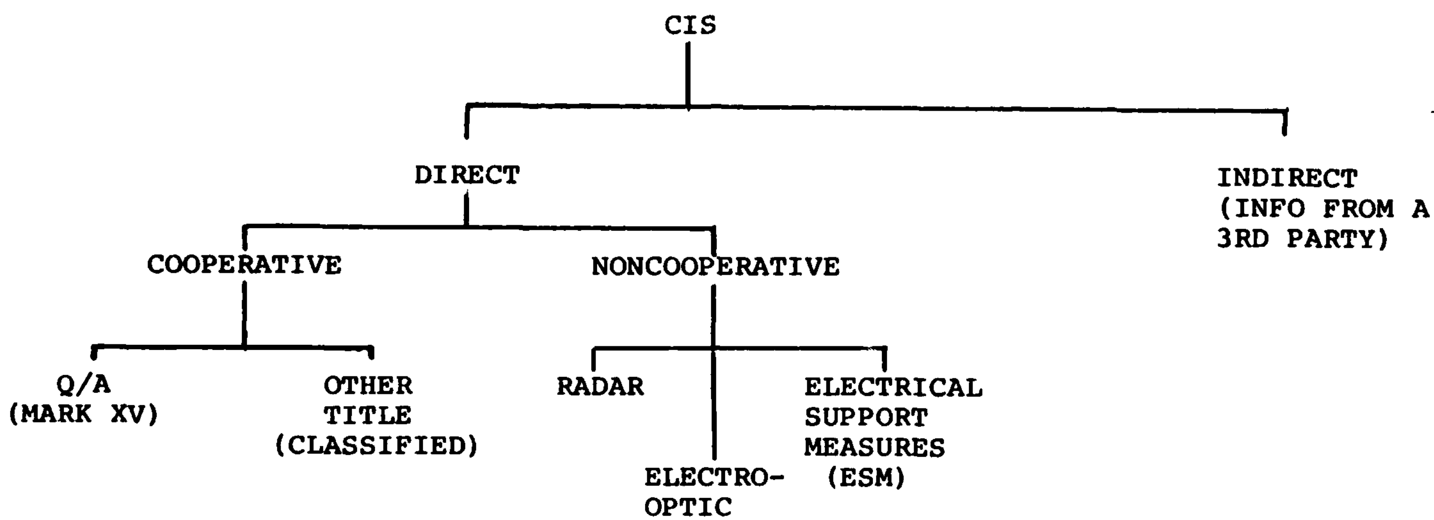

Figure 2. The Environment Outlined by the CIS Charter

The interrogator emits a signal requesting identification information and the receiver collects the return data. This portion of the system is referred to as the "Q and A" (question and answer) portion of the system. The Q and A portion of the system deals with the procurement of a "black box" designated as the Mark XV. This is to be a unit that can be mounted onboard an aircraft, ship, or land vehicle.

The noncooperative portion of the direct identification concept of the total system utilizes radar (radar signatures), electro-optical (Infrared signatures), and electrical support measures (emission reading) to achieve identification.

Higher headquarters direction (interview, 27 Jul 82, LTC Molnar) has stated that the highest priority within CIS is the acquisition of the Mark XV. Areas outside of the Mark XV are to be monitored at present. This scoping of the environment allows the task environment to be defined in terms of customers, suppliers, regulatory agencies, competitors and the scientific-technical community.

The customers are Headquarters Tactical Air Command and the Tactical Air Forces, Army Training and Doctrine Command and Army air defense components, and Naval Sea and Air units through the Chief of Naval Operations.

Suppliers for CISPO fall into two categories: (1) financial, manpower and workspace, and (2) hardware provisioning. The Department of Defense and the Congress provide the financial resources, the Aeronautical Systems Division (ASD) of Air Force Systems Command provides the military and civilian manpower and workspace, and three teams of civilian contractors provide the hardware.

Regulatory agencies consist of the Department of Defense (the Systems Acquisition Process and the Planning, Programming and Budgeting System), the National Security Agency (Communications Security Requirements), the Federal Aviation Agency (Air Traffic Control Requirements), and the Frequency Management Office (Frequency Requirements).

Competitors for financial resources consist of all other Department of Defense programs in general and all other tactical programs in particular. CISPO must compete with all other ASD programs and staff offices for personnel and office space.

The technical-scientific community consists of the laboratories of the three services, the platform system program offices, the civilian contractors, and the developments that occur in the European community.

During the interview of Lieutenent Colonel Molnar on 21 July 1982, the concepts and definitions of the task environment matrix (see page 20) were discussed. In the subject interview of 27 July 1982, Lieutenant Colonel Molnar presented his perceptions of the various portions of the task environment.

Customers were felt to be complex, but could be dealt with in a routine fashion. The customers were organized, could be contacted directly, displayed a low rate of change, and were extremely stable.

The category of suppliers is broken into two divisions. The suppliers of financial, manpower, and work space were perceived as complex, nonroutine, organized, could be dealt with in a direct fashion, their rate of change was high, and that rate of change was relatively unstable. Suppliers that provided hardware, "black boxes," were noncomplex, routine, organized, dealt with directly, had a rate of change that was low, and quite stable.

Competitors were noncomplex, nonroutine, organized, had to be dealt with indirectly, experienced a high rate of change, and that rate of change was unstable.

The scientific-technological community was complex, nonroutine, unorganized, had to be dealt with indirectly, exhibited a very high rate of change and that rate of change was very unstable.

These perceptions of the task environment are summarized in Figure 3.

Movement		General characteristics															
		Noncomplex								Complex							
		Routine				Nonroutine				Routine				Nonroutine			
		Organized		Unorganized		Organized		Unorganized		Organized		Unorganized		Organized		Unorganized	
		D	I	D	I	D	I	D	I	D	I	D	I	D	I	D	I
Low change rate	Stable	SP								C							
	Unstable																
High change rate	Stable													R			
	Unstable						CO							S			ST

*D=Direct I=Indirect

C = Customer Portion of Task Environment
SP = Supplier (hardware provisioning) Portion of Task Environment
S = Supplier (finances, manpower, space) Portion of Task Environment
R = Regulatory Portion of Task Environment
CO = Competitor Portion of Task Environment
ST = Scientific-Technological Portion of Task Environment

Figure 3. Summary of Task Environment

Strategies

Most contingency theorists incorporate some aspect or descriptor relating to the purpose of the organization in their approach to organizational design. Hrebiniak (1978), Kast and Rosenzweig (1979), Perrow (1970), and Robey (1982) use organizational goals as their descriptor while Jelinek, Litterer, and Miles (1981), Miles and Snow (1978), Szilagyi (1981), Ullrich and Wieland (1980) and this author choose to use strategy as the descriptor.

Strategy refers to the means or process by which the organization hopes to achieve its goals (Ullrich and Wieland, 1980). Strategy delimits the intent of the organization, defines the domain or market, and specifies the way in which that domain will be served. Additionally, strategies dictate a broad set of organizational requirements; i.e., technologies, resource and personnel requirements, and distribution, management, communication, and control systems, that must be congruent with said strategy for efficient goal achievement (Jelinek, et al., 1981).

The strategy developed by a particular organization is reflected by the pattern in the streams of organizational decisions. This dynamic view of strategy development includes both formulated and unintentional strategies. Unintentional strategies are those that merely evolve as a result of a series of decisions (Mintzberg, 1979). Miles and Snow (1978) identify three "problem areas," the answers to which appeared to be the predominant factors in the development of strategy within the organizations that they studied. These "problem areas" are entrepreneurial, engineering, and administrative.

Entrepreneurial problems revolve around the selection of a specific product or market target. Once established, future entrepreneurial ventures become limited by the existing management structure and technology (Miles and Snow, 1978). This difficulty in changing markets and/or strategies is also noted by Chandler (1962).

The engineering problem is best characterized as the response to the solution of the entrepreneurial problem by a particular organization. The engineering problem solution deals primarily with the selection of a transformation process and the associated communication and control systems.

According to Miles and Snow (1978), solving the administrative problem is a combination of reducing uncertainty in the organization, and formulating and implementing those processes that allow the organizational innovation.

These three problem areas taken together form what Miles and Snow (1978) refer to as the "adaptive cycle." According to their research, this cycle is extremely dynamic with problem areas often overlapping and is apparent in all organizations. By studying the adaptive cycles of organizations Miles and Snow (1978) were able to establish the typology of strategies that organizations develop in coping with the adaptive cycle. The typology defines four basic strategies, three of which they consider stable or capable of producing an organization that would be an effective competitor, and one strategy that is unstable resulting in an organization slow to respond to opportunities and hence exhibits poor performance.

The three stable strategies are termed defender, prospector, and analyzer, while the unstable strategy is referred to as reactor (Miles and Snow, 1978). Characteristics of each stable strategy are summarized in Tables 1 to 3.

The fourth type of strategy, termed the reactor, refers to being unable to cope with a changing environment. According to Miles and Snow (1978), this type of strategy results from any of three reasons. The first is that the organization's management has failed to specify a viable strategy. Second, the strategy while stated doesn't link technology, structure, and process. Third, management insists on clinging to an outmoded strategy.

The failure to specify a viable strategy is typified by a lack of consensus about the future domain and structure of the organizaticn. Organizations utilizing the reactor strategy lack definition in the expected roles

TABLE 1

CHARACTERISTICS OF THE DEFENDER

Entrepreneurial Problem	Engineering Problem	Administrative Problem
Problem: How to "seal off" a portion of the total market to create a stable set of products and customers	Problem: How to produce and distribute goods or services as efficiently as possible	Problem: How to maintain strict control of the organization in order to ensure efficiency
Solutions: 1. Narrow and stable domain 2. Aggressive maintenance of domain (e.g., competitive pricing and excellent customer service) 3. Tendency to ignore developments outside of domain 4. Cautious and incremental growth primarily through market penetration 5. Some product development, but closely related to current goods or services	Solutions: 1. Cost-efficient technology 2. Single core technology 3. Tendency toward vertical integration 4. Continuous improvements in technology to maintain efficiency	Solutions: 1. Financial and production experts most powerful members of the dominant coalition; limited environmental scanning 2. Tenure of dominant coalition is lengthy; promotions from within 3. Planning is intensive, cost-oriented, and completed before action is taken 4. Tendency toward functional structure with extensive division of labor and high degree of formalization 5. Centralized control and long-looped vertical information systems

TABLE 1--Continued

Entrepreneurial Problem	Engineering Problem	Administrative Problem
		6. Simple coordination mechanisms and conflicts resolved through hierarchical channels 7. Organizational performance measured against previous years; reward system favors production and finance
Costs and benefits: It is difficult for competitors to dislodge the organization from its small niche in the industry, but a major shift in the market could threaten survival	Costs and benefits: Technological efficiency is central to organizational performance, but heavy investment in this area requires technological problems to remain familiar and predictable for lengthy periods of time	Costs and benefits: Administrative system is ideally suited to maintain stability and efficiency but is not well suited to locating and responding to new product or market opportunities

(Source: Miles and Snow, 1978:48)

TABLE 2

CHARACTERISTICS OF THE PROSPECTOR

Entrepreneurial Problem	Engineering Problem	Administrative Problem
Problem: How to locate and exploit new product and market opportunities	Problem: How to avoid long-term commitments to a single technological process	Problem: How to facilitate and coordinate numerous and diverse operations
Solutions: 1. Broad and continuously developing domain 2. Monitors wide range of environmental conditions and events 3. Creates change in the industry 4. Growth through product and market development 5. Growth may occur in spurts	Solutions: 1. Flexible, prototypical technologies 2. Multiple technologies 3. Low degree of routinization and mechanization; technology embedded in people	Solutions: 1. Marketing and research and development experts most powerful members of the dominant coalition 2. Dominant coalition is large, diverse, and transitory; may include an inner circle 3. Tenure of dominant coalition not always lengthy; key managers may be hired from outside as well as promoted from within 4. Planning is broad rather than intensive, problem oriented, and cannot be finalized before action is taken 5. Tendency toward product structure with low

TABLE 2--Continued

Entrepreneurial Problem	Engineering Problem	Administrative Problem
		division of labor and low degree of formalization 6. Decentralized control and short-looped horizontal information systems 7. Complex coordination mechanisms and conflict resolved through integrators 8. Organizational performance measured against important competitors; reward system favors marketing and research and development
Costs and benefits: Product and market innovation protects the organization from a changing environment, but the organization runs the risk of low profitability and overextension of its resources	Costs and benefits: Technological flexibility permits a rapid response to a changing domain, but the organization cannot develop maximum efficiency in its production and distribution system because of multiple technologies	Costs and benefits: Administrative system is ideally suited to maintain flexibility and effectiveness, but may underutilize and misutilize resources

(SOURCE: Miles and Snow, 1979:66)

TABLE 3

CHARACTERISTICS OF THE ANALYZER

Entrepreneurial Problem	Engineering Problem	Administrative Problem
Problem: How to locate and exploit new product and market opportunities maintaining a firm base of traditional products and customers	Problem: How to be efficient in stable portions of the domain and flexible in changing portions	Problem: How to differentiate that organization's structure and processes to accommodate both stable and dynamic areas of operation
Solutions: 1. Hybrid domain that is both stable and changing 2. Surveillance mechanisms mostly limited to marketing; some research and development 3. Steady growth through market penetration and product-market development	Solutions: 1. Dual technological core (stable and flexible conponent) 2. Large and influential applied research group 3. Moderate degree of technical efficiency	Solutions: 1. Marketing and applied research most influential members of dominant coalition, followed closely by production 2. Intensive planning between marketing and production concerning stable portion of domain; comprehensive planning among marketing, applied research, and product managers concerning new products and markets 3. Matrix structure combining both functional divisions and product groups

TABLE 3--Continued

Entrepreneurial Problem	Engineering Problem	Administrative Problem
		4. Moderately centralized control system with vertical and horizontal feedback loops 5. Extremely complex and expensive coordination mechanisms; some conflict resolution through normal hierarchical channels 6. Performance appraisal based on both effectiveness and efficiency measures, most rewards to marketing and applied research
Costs and benefits: Low investment in research and development, combined with imitation of demonstrably successful products, minimizes risk, but domain must be optimally balanced at all times between stability and flexibility	Costs and benefits: Dual technological core is able to serve a hybrid stable-changing domain, but the technology can never be completely effective or efficient	Costs and benefits: Administrative system is ideally suited to balance stability and flexibility, but if this balance is lost, it may be difficult to restore equilibrium

(SOURCE: Miles and Snow, 1978:79)

and relationships. Control and planning are performed in a haphazard and inconsistent fashion (Miles and Snow, 1978).

The lack of linkage between technology, structure, and process is exemplified by an organization that adopts a strategy that indicates the requirement for a divisional structure while the organization is in a functional alignment. Also, the attempt to institute long-range planning for extremely turbulent environments is another example of nonlinkage (Miles and Snow, 1978).

Organizations that attempt to cling to an outmoded strategy are usually those organizations whose environment has remained constant or stable for a considerable period of time prior to some event that opens their market to more competitors.

The following section will describe the strategy employed by CISPO.

CISPO Strategies

The definitions and concepts of the classification of strategy were presented to Lieutenant Colonel Molnar during the interview of 21 July 1982 and Lieutenant Colonel Molnar presented his perception of the strategy used by CISPO during the interview of 27 July 1982.

The entrepreneurial problem within CISPO was felt to be typified by what Miles and Snow (1978) referred to as the defender. The defender's approach to the entrepreneurial problem is characterized by a narrow market or domain and a tendency to ignore developments outside of that domain or market.

CISPO's approach to the engineering problem is basically that of the defender. This is primarily dictated by the DSARC Requirements and the applicable Air Force Regulations and Department of Defense Instructions. Technology in the case of strategy refers to the technology used in the program office to produce their product, information to higher level decision makers, and not the technology to be used by the contractor in producing his "black box."

How to facilitate and coordinate numerous and diverse operations is an accurate description of the administrative problem faced by CISPO. This situation leaves CISPO in the position of a prospector with respect to the administrative problem.

Internal Technologies

Szilagyi (1981:305) defines technology as "a transformation process by which mechanical and intellectual efforts are used to change inputs into products." While this definition is generally accepted from a theoretical standpoint, the operationalization of such a definition is somewhat difficult and has a tendency to concentrate on division of labor (Jelinek, et al., 1981). Gillespie and Mileti (1979:51-52) state:

> A comprehensive definition of technology should thus take into account machine sophistication, the nature of raw materials, and the nature of task characteristics, including degrees of control or discretion. In other words, the definition should specify the salient aspects of technology, differentiating it from other things.

Hunt and Near (1980), Ovalle (1981), Thompson (1967), and Woodward (1970) see the requirement for an expanded definition of technology that includes aspects of control, discretion, or decision-maker choice. The definition that will be used in this thesis will be that of Jelinek, et al. (1981:171):

> For our purposes, we shall define technology as the tools, equipment, or materials; knowledge and skills to use them; and coordinative mechanisms and patterns of activity utilized to accomplish the organization's work.

The definition allows for the inclusion of multiple technologies, and is applicable outside the manufacturing realm.

Ovalle (1981) uses five characteristics or dimensions to describe technology. These include:

1. Task predictability
2. Task variability
3. Task difficulty
4. Interdependence of tasks
5. Nature of the production process

The first two characteristics of technology, task predictability and variability, can be grouped together resulting in a measure of what Perrow (1967) termed "the number of exceptional cases encountered in the work" and "the analyzability of the search procedures." Task predictability and variability is reflected by encountering the same kinds of problems from day-to-day, having little variety in the work one does, by being able to predict the frequency of request for information that creates work for one's self, and the use of similar techniques in finding information necessary to complete work requests. Since there is no absolute scale on which to measure predictability and variability, these characteristics are noted based on the perception of those performing the tasks.

Task difficulty is defined by Ovalle (1981:44) as "the extent to which there are known procedures specifying the sequence of steps to be followed in performing the task." Again, this dimension of technology is perceived by the person doing the work. Task difficulty may be represented by the clarity and understandability of the sequence of steps followed to accomplish the work, the frequency of problems that have no immediate solution, the similarity of problems from one day to the next, and whether problems require a great amount of consultation with fellow workers before solutions can be achieved (Ovalle, 1981).

The interdependence of tasks according to Ovalle (1981:44) refers to "the amount of intra and interdependence among tasks performed by individuals." The measure attempts to define the degree to which one worker's performance affects the performance of subsequent work. Interdependence is reflected by the requirement for work to be completed first by others in a particular work group or others in a different work group, the need for my work by others in and outside of a particular work group, and the amount of time spent on interactions concerning work both within and without of a particular work group.

The characteristics relating to the nature of the production process are based on the results obtained by Woodward (1965). Whether outputs are customized or fairly similar, the rate at which the outputs change from being customized to similar or vice-a-versa, and if the "production" process is standardized and remains constant over time reflect the nature of the production process (Ovalle, 1981).

The following section will contain a description of the internal technology of CISPO base on the dimensions that were previously defined.

CISPO's Internal Technology

Complex organizations initially develop strategy (that may or may not be explicitly stated (Mintzberg, 1979) in response to a given external environment. As a result, the multiple technologies that are chosen ultimately interact with the external environment create feedback for the organization (Figure 6 in Chapter III). This feedback, usually in the form of economic performance of the organization, brings changes in the strategy and subsequently changes in technologies. Assessment of CISPO's internal technology is made with respect to its external (task) environment.

Perceptions about the internal technology employed in CISPO are the result of interviews with the Deputy Program Director, Lieutenant Colonel Molnar, conducted on 10 and 14 August 1982. Value assignments of low, medium, and high were used to characterize the degree of predictability, variability, difficulty, and interdependence of the internal technology or process used by CISPO in coping with the components of the task environment. Standardized and stable output, or custom and dynamic output were the descriptors used to assess the independent variable, nature of the process.

In the customer subenvironment predictability, variability, and difficulty of the internal technology employed were judged to be medium. Interdependence tended to the low end of the scale. The nature of the process was said to be in the middle of the two possibilities, standardized and stable, or custom and dynamic.

The process used to deal with both components of the supplier subenvironment was characterized by low predictability, high variability, high difficulty, and high interdependence. The nature of the process for acquiring money, manpower, and workspace was standardized and stable, while the nature of the process for the provisioning aspects of the supplier subenvironment was between the two extremes.

Two technologies were used in dealing with the subenvironment of regulatory agencies. One of the technologies operated with respect to the Planning, Programming, and Budgeting System (PPBS) and the other operates with respect to the remainder of the regulatory subenvironment. The process used to deal with the PPBS portion of the subenvironment is characterized by high variability, low predictability, high difficulty, high interdependence, and a process nature between the two extremes. The technology employed in the remainder of the subenvironment has low variability, high predictability, high difficulty, low interdependence, and a process nature tending toward standardized and stable.

The technology used in the competitor subenvironment reflects low variability, high predictability, medium difficulty, medium interdependence, and a process nature tending toward standardized and stable.

The technological process used by CISPO when it interacts with the scientific-technological environment is characterized by high variability, low predictability, high difficulty, high interdependency, and a process nature that is custom and dynamic.

CHAPTER III

MODEL BUILDING

This chapter will begin with a synopsis of the structural implications of the contingent factors, task environment, strategy, and internal technology. The init al assessment of the contingent factors as applied to CISPO (Chapter II) will next be coupled with the aforementioned structural implications and the requirements imposed by Air Force Regulation (800 series) to establish a proposed organizational structure.

Structural Implications of the Contingency Factors

External Environment

Most contingency theorists agree about the primacy of the external environment among the contingent factors. The structural implications of the task environment are based primarily on the combined works of Burns and Stalker (1961), Lawrence and Lorsch (1967), Perrow (1967), and Thompson (1967).

According to Lawrence and Lorsch (1967), economically effective organizations displayed different degrees of differentiation. In their study of ten organizations the degree of differentiation was dependent on the certainty, and homogeneity of the external environment. The definition of differentiation used by the aforementioned authors is "the difference in cognitive and emotional orientations among managers in different functional departments [Lawrence and Lorsch, 1967:5]." Dalton, Lawrence and Lorsch (1970) suggest that economically effective organizations base differentiation on the "whole task." The "whole task" may be represented by:

> . . . time groupings (as with shifts in electricity generation), by technological groupings (weaving looms in a textile plant), by territorial groupings (track crews on a railroad), or by some combination of these [Dalton, Lawrence, and Lorsch, 1970:275].

Whole task differentiation allowed for realistic accountability, and gave those in a particular work group a chance to derive satisfaction from identification with a recognizable goal. There was a strong indication of the nonexistence of whole tasks if the task relationships within a particular subgroup of an organization was less intense than the relationships between subgroups of that organization.

Using extent of formalization in the unit structure, interpersonal orientation, and time orientation as characteristics of differentiation, Lawrence and Lorsch (1967) established the relationships between certainty of the environment and differentiation as summarized in Figure 4. The study of twenty industrial organizations by Burns and Stalker (1961) also identified the dependence

	Environmental Certainty		
	High	Moderate	Low
Extent of formalized unit structure	Low	Medium	High
Interpersonal orientation	Task	Social	Task
Time orientation	Long	Medium	Short

Figure 4. Certainty vs Differentiation (Dalton, Lawrence and Lorsch, 1970:6)

of the degree of formalization of organizational structure on the certainty of the external environment. They chose to identify the extremes of the continuum of structural possibilities. At one extreme of this continuum Burns and Stalker (1961) identified the "mechanistic" structure and characterized it as having a stable external environment, programmed decision making, a centralized and formal organizational structure with an emphasis on the use of rules, and vertical communications that consisted primarily of orders and directions. At the opposite end of the continuum is the "organic" structure characterized by a dynamic and unstable external environment, nonprogrammed decision making, a decentralized and flexible structure with few rules, and vertical and horizontal communication that heavily relies on advice and counsel.

Lawrence and Lorsch (1967) also found that the "dominant competitive issue," that issue, task or operation whose accomplishment dictates the economic ranking within the industry, establishes the relationships within the organization and to a great degree the priority among such relationships. Again, the authors found that the economically effective organizations were the ones that achieved effective integration among the relationships which were formed around the dominant competitive issue. Integration being defined as "quality of the state of collaboration that exists among departments that are required to achieve unity of effort by the environment [Dalton, Lawrence, and Lorsch, 1970:5]."

Lawrence and Lorsch (1967) found that a strong inverse relationship exists between differentiation and integration. But, in light of this conflict the most economically effective organizations achieve more differentiation and more integration in a given external environment. In order for organizations to be both highly differentiated and highly integrated, the business must, according to Dalton, Lawrence, and Lorsch (1970), develop more complicated integration mechanisms. These authors believe the basic mechanism of integration within the organization to be the managerial hierarchy. Lawrence and Lorsch (1972) state that Thompson's (1967) typology of interdependence (pooled, sequential, and reciprocal) can be utilized in understanding differentiation and integration within the managerial hierarchy and is useful in understanding the actual coordination required in the technological core of the organization. Thompson's (1967: 54-55) definitions of the types of interdependencies are:

> Pooled--Where each part renders a discrete contribution to the whole and each is supported by the whole, but no direct interaction is required between the units of the organization.
>
> Sequential--When direct interdependence can be pinpointed between (the units) and the order of the interdependence can be specified.
>
> Reciprocal--When the outputs of each (unit) become the input for the others . . . under conditions of reciprocal interdependence each unit involved is penetrated by the others.

Thompson (1967) proposes that complex organizations have all three types, while moderately complex organizations display pooled and sequential and the simplest organizations exhibit only pooled interdependency. March and Simon (1958) and Thompson (1967) presented the untested propositions that pooled interdependence would be achieved through the use of standardization (i.e., standard decision rules and procedures), sequential interdependence would be achieved by a formulation of schedules or plans governing the actions of the units involved, and reciprocal interdependence would use the mechanism of mutual adjustment to achieve the required coordination (i.e., face-to-face interaction and feedback). These propositions were tested by Lawrence and Lorsch (1972) and found to be supported in general. The relationships between environmental diversity, differentiation, integration and the mechanisms used is summarized in Figure 5. A second integrating mechanism noted by Lawrence and Lorsch (1967) was the ability to

Environmental Diversity	Differentiation	Integration	Meahanisms Used
High	High	High	Teams, Roles, Departments, Hierarchy, Plans and Procedures
Moderate	Moderate	High	Roles, Plans, Hierarchy, and Procedures
Low	Low	High	Hierarchy, Plans and Procedures

Figure 5. Integrating Mechanisms (Dalton, Lawrence, and Lorsch, 1970:13)

resolve conflicts among individuals. The factors of conflict resolution that varied with the external environment are the pattern of power or influence among groups and the pattern of influence at various levels of the management hierarchy of each group. In economically effective organizations where conflict was managed effectively influence was concentrated at the hierarchical level where information relevant to the decisions was present (Dalton, Lawrence, and Lorsch, 1970).

Strategy

Initially, strategy dictates technology, but Figure 6 shows that feedback from implemented management and organizational structures modifies the internal technology employed, the strategy selected; but to a lesser degree, the external environment. While future strategic alternatives of an organization may be limited by existing strategies, failure to make structured changes supporting any modifications of the strategy will result in economic inefficiency (Chandler, 1962; Galbraith and Nathanson, 1978; Ullrich and Wieland, 1980). The structural implications of strategy noted in this thesis stem from the work of Chandler (1962), Galbraith and Nathanson (1978), and Miles and Snow (1978).

Chandler (1962) examined strategy in terms of the stages of development through which an organization might

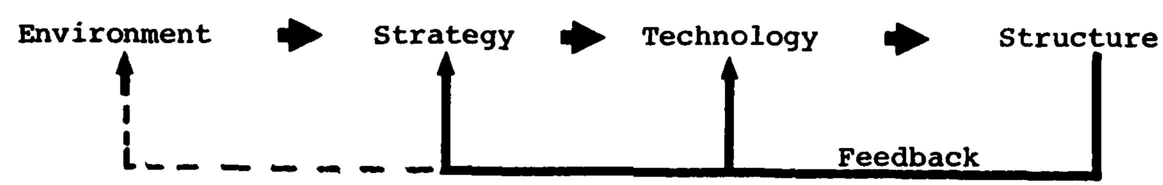

Figure 6. The Relationship of Strategy to other Contingent Factors

pass. The strategy of newborn firms, Chandler's (1962) Stage I and II prior to diversification, is centered around growth in business volume and vertical integration. Most of these organizations are primarily concerned with the production of a single product or product line. Implicit in this observation is the existence of a core technology within the firm. Miles and Snow (1978) found that "Defender" like strategy in the entrepreneurial, engineering, and administrative arenas closely parallels Chandler's (1962) structural findings. Chandler (1962), Galbraith and Nathanson (1978), and Miles and Snow (1978) find that functional organizations supplied sufficient interunit coordination, specialization and standardization to support this strategy.

The Prospector strategy observed by Miles and Snow (1978) is characterized by development of diversified product lines that are managed in a decentralized fashion. This type of strategy corresponds directly to Chandler's (1962) Stage III of organizational development. Chandler (1962), Galbraith and Nathanson (1978) and Miles and Snow (1978) identify product or divisional organizational structures as the dominant organizational types fitting the diversification strategy because these structures are the minimum that allow quick response to changes in individual markets while reducing information requirements. The primary structural differences between the prospector and the defender strategies are in the areas of division of labor and structural formulization is less extensive in the prospector strategy.

Based on the research of Miles and Snow (1978), the Analyzer strategy of exploiting new market opportunities while maintaining traditional product lines that exhibit stable processes and demands requires structural elements that occur in Stage II and Stage III of Chandler's (1962) organizational development. The characteristic organizational structure according to Miles and Snow (1978) is a matrix of products and functional processes. Here the product and functional areas are largely independent of one another except during the process standardization of a new product.

Studies by Miles and Snow (1978) revealed that the "Reactor" strategy was representative of an organization in transition from one strategy-structure relationship to another. Chandler (1962) noted a similar condition existed when an organization's diversification efforts were foiled by administrative constraints. Thus, the strategy-structure fit is inappropriate (this can occur between any two of Chandler's (1962) stage) and, according to Miles and Snow (1978), the search for a better fit is seldom aggressive.

Internal Technology

Perrow (1967), Thompson (1967), and Woodward (1965) all developed categorization schemes that were based on different characteristics of internal technology. Woodward's (1965) typology used the methods and processes as a basis of division. Thompson's (1967) division was based on the way firms organize to accomplish tasks. Perrow's categorization was based on the number of exceptions and the search procedures used. Figure 7 shows the relationships between these three categorization schemes.

While Thompson (1967) argues for a core or global technology, both Woodward (1965) and Perrow (1967) espouse the existence of multiple technologies within a single organization. Magnusen (1970) found a stronger correlation to exist between Perrow's (1967) theory and actual occurrence when technologies of individual divisions were considered than he found when he examined the technology of the organization as a whole. When Woodward (1965) observed multiple technologies to exist in the same firm, she found them to be independently organized.

Increasing technological complexity according to Woodward (1965) referred to control over the production process; whereas, Perrow's (1967) view of technical complexity deals with numbers of exceptions to normal procedures and the solution search procedures.

Woodward (1965)	Thompson (1967)	Perrow (1967)
		Routine
Process	Mediating	
		Planned Contingencies
Large Unit and Mass Production	Long-Linked	
		Ad Hoc
Unit and Small Batch	Intensive	Nonroutine

Figure 7. Categorizations of Internal Technology

Woodward (1965) found that as technology of the organization progresses from unit to process the shape of the structure of the firm is characterized by an increasing number of management levels, increasing use of management by commiteee, and an increased span of control for the chief executive. The span of control of the first-line supervisor is greater in mass production technology than either unit or process technology. Woodward (1965) also found that the organizations that were economically efficient were those organizations whose span of control for the first-line supervisor level closest to the average span of control for the industry as a whole. The organizational structure typical of unit or small batch technologies was organic in nature, mass production technologies were dominated by mechanistic structures, while process technology utilized organic structures with impersonal methods of control.

While the structural implications of technology according to Perrow (1967) are similar for the most part to those proposed by Woodward (1965), a difference does arise in the case of the process technology. This difference may be due to the masking tendency inherent in the use of production process as a classifier (Woodward (1970) introduced the degree variability of the production process into her classification scheme). Where Woodward (1965) measured "traditional" characteristics of the organization (i.e., levels of management and span of control), Perrow (1967) chose independent variables of discretion, power, coordination type, and interdependence of technical and supervisory levels. The summary of characteristics and the resultant structural type is given in Figure 8.

At the routine end of the continuum (see Figure 7) Perrow (1967) suggests a formal centralized or mechanistic type of organization where operational management isn't allowed to choose among the means to accomplish the task (discretion), choices about basic goals and strategies (power) are retained by the technical specialists in the organization, and where problem solving and interaction between members is directive in nature. The nonroutine end of the continuum reveals an organic type structure where the organization may respond to transient technological situations with transient organizational forms (i.e., team management, matrix, strategic business units, product or divisional structures). These technologies are further characterized by multiple activity and decision centers.

Development of the Proposed Organizational Structure

Development of a proposed organizational structure based on the contingent factors of external environment, strategy, and internal technology requires the establishment of an integrating process. Ford and Slocum (1977) state

	Discretion	Power	Type of Coordination	Amount of Interdependence between Technical and Supervisory Levels	Discretion	Power	Type of Coordination	Amount of Interdependence between Technical and Supervisory Levels
Technical	Low	Low	Plan	Low	High	High	Feedback	High
Supervision	High	High	Feedback		High	High	Feedback	
Problem-solving Pattern	Ad Hoc				Nonroutine			
Organization Structure	Decentralized				Flexible, Polycentralized			
				Cell 1	*Cell 2*			
Technical	Low	High	Plan	Low	High	High	Feedback	Low
Supervision	Low	Low	Plan		Low	Low	Plan	
Problem-solving Pattern	Routine				Planned Contingencies			
Organization Structure	Formal, Centralized				Flexible, Centralized			
				Cell 4	*Cell 3*			

Figure 8. Technology, Task and Structure (Perrow, 1970:81)

that relationships between contingent factors and structure vary depending on whether the contingent factors are considered individually or in combination. Therefore, the process of this thesis will use a moderated approach (no one factor being dominant over the others) in assembling the information of the contingent factors. The integrating process in the case of CISPO has the following five sequential steps:

1. An alignment check of the relationship between the external environment and the chosen strategy, and between the chosen strategy and the internal technologies used.

2. Segmentation of the organization's work on some basis.

3. Identify the subenvironments that are encountered, handled, or engaged by each of the segments of the organization specified in step 2.

4. Describe the structural characteristics required of each segment identified in step 2 based on its interactions with the external environment and its internal technologies.

5. Integration of the segments of the organization under the office of the CISPO Director.

Step 1

Contingent theory of organization hypothesizes that economically efficient organizations have achieved a "fit" between their contingent factors (Lawrence and Lorsch, 1967; Woodward, 1965). The "fit" refers to combinations of types of environment, strategy, and technology that appear frequently in the business community. The combinations mentioned here are not intended to be all-inclusive and should be used as only an illuminator of possible inconsistencies (i.e., simple and stable environment, defender strategy, and a complex type of technology).

The evaluation of the appropriateness of the strategy for a particular environment is highly subjective and revolves around the ability of the organization to achieve its goals through the implementation of a particular strategy. Examples of inappropriate strategy employment occur when an organization chooses to diversify into an environment that is vastly different than the original (i.e., a container manufacturer moving into the plastics industry), or when the environment of a particular industry changes radically (i.e., changes in the energy industry between the 50s and the late 70s). Imposition of the old strategy that emphasizes cost effectiveness when the new environment indicates the need for a problem-solving emphasis is an example of this type of dysfunction.

In the case of CISPO the strategy is unusual in that it is composed of part defender and part prospector (reference pages 38-39). The mixed strategy exhibited by CISPO is appropriate in both content and composition. The content appears to be consistent with CISPO's current position within the general acquisition cycle. CISPO is currently preparing to enter a review by the Defense Systems Acquisition Review Council (DSARC) that is commonly referred to as DSARC I. The intended entrepreneurial thrust of CISPO during this period is best characterized as attempting to assure that

> . . . mission and performance envelopes are adequately defined, technically feasible, and capable of achieving the stated objectives within reasonable cost and schedule constraints [AFSC Pamphlet 800-3, 1976].

This entrepreneurial thrust corresponds well to the perceived strategy of attempting to create a stable set of products and customers.

It should be noted that the sequence of "growth strategies" of a system program office is just the reverse of that proposed by Chandler (1962). The span of effort in a program office contracts with time rather than expanding as Chandler (1962) proposes. In the infant stages a program office is concerned with the evaluation of different product possibilities (product divisions in a loose sense) and alternative investments proposals while the fully developed system program office is involved in a single industry, a single location (usually one contractor), and a single function (manufacturing). Therefore, the movement of CISPO's strategy toward the defender type is understandable.

CISPO's strategic response to the engineering problem is largely dictated by the acquisition process that is specified by the DOD. The basic procedure (the system acquisition process) for acquiring a weapons system can be considered to be a cost-efficient core technology. Currently, the core technology is undergoing a rather extensive revision under the direction of Under Secretary of Defense Carlucci (Brabson, 1981). The revision of the core technology, the unique technological requirements due to the triservice and multinational aspects of CISPO, and the inherent lag of the organization's response to the administrative problem requires an administrative system that facilitates rather than controls the organization's operations. Hence, the prospector strategy matches the requirements of the administrative problem posed by CISPO.

On the basis of the foregoing discussion the perceived strategy of CISPO (reference pages 38-39) appears to be compatible with the organization's environment and goals.

Successful implementation of a strategy is initially dependent on the appropriateness of the chosen internal technology. Ascertation of the "fit" or compatibility between strategy and internal technology is still subjective, but interdependencies and causal relationships are more clear. For example, strategies that attempt to stabilize a set of products and customers (defender strategy) would be best served by the development of a single cost-efficient technology that is characterized by extensive planning, conflict resolution based in the business hierarchy, and vertical information systems. On the other hand, a strategy that attempts to locate and exploit new products and market opportunities (prospector strategy) is more likely to benefit from multiple technologies that are flexible and are characterized by planning that is problem oriented, information systems that are horizontal in nature, and less specialization in the division of labor (Miles and Snow, 1978; Szilagyi, 1981; Ullrich and Wieland, 1980).

Figure 9 provides a summary of the perceptions of the internal technologies employed by CISPO. This summary reflects the data presented in Chapter II and adds a subjective evaluation of the overall classification or evaluation. The overall evaluation is based on an "average" of the responses to predictability, variability, and difficulty with interdependence and process type being used as "tie-breakers." Using the descriptors of Burns and Stalker (1961) an overall evaluation of L or low would

TECHNOLOGY

ENVIRONMENT		Predict-ability	Vari-ability	Diffi-culty	Inter-Dependence	Nature of Process	Overall Evaluation
	Customer	M	M	M	L	Mixed	M
	Competitor	H	L	M	M	S	L
	Supplier (Provision)	L	H	H	H	Mixed	H
	Supplier (Financial)	L	H	H	H	S	H
	Reg. Agency (Acq Sys/ PPBS)	L	H	H	H	Mixed	H
	Reg Agency (Other)	H	L	H	L	S	L
	Sci-Tech	L	H	H	H	C	H

Mixed = Between extremes of standardized and stable, and custom and dynamic.

Figure 9. Summary of CISPO Technology

reflect a technology exhibiting mechanistic tendencies (i.e., centralization of authority and responsibility, and extensive planning and programming). An H or high refers to a technology exhibiting organic characteristics (i.e., problem-solving orientation, flexibility, and decentralization).

A direct comparison between these technologies and strategy is inhibited by the dissimilarity of their respective classification scheme. The assessment of the compatibility between strategy and internal technology will be made after arbitrarily grouping the technologies among the three problem areas that characterize CISPO's strategy.

The customer and competitor technologies will be grouped with the entrepreneurial problem. That portion of the regulatory agency technology dealing with the acquisition system and the Planning, Programming, and Budgeting System will be grouped with the engineering problem. The rest of the technologies will be grouped with the administrative problem.

Miles and Snow (1978) characterize the defender's approach to the entrepreneurial problem as one oriented toward economic efficiency with attention to reduction in manufacturing and distribution costs, and through familiarity with the needs of the customer. The mechanistic tendency exhibited by the customer and competitor technologies will complement the aforementioned aspects of the CISPO strategy.

The high or organic classification of the technology associated with the engineering problem may at first glance appear to be inconsistent with a defender strategy. The uncertainty and hence the requirement for the organic type of technology can be attributed to the current revisions to the acquisition system or process. Most of the revisions are oriented at making the acquisition process more efficient (Bradson, 1981). Miles and Snow (1978) indicate that updating current technology to maintain efficiency is characteristic of the defender response to the engineering problem. Hence, what would appear to be an inconsistency is not.

An aggregation of the remaining technologies (Figure 9) indicates an organic technology is being used to implement CISPO's response to the administrative problem. CISPO's perceived strategy with respect to the administrative problem is perspective in nature (pages 38-39). The perspective response is characterized, according to Miles and Snow (1978), by planning that is problem oriented and contingent on feedback from experimentation, by less extensive division of labor, by horizontal feedback loops, and by complex and expensive forms of coordination. In the case of CISPO's strategy in the administrative area an organic technology is quite compatible.

In summary, there is a reasonable degree of compatibility between the external environment and the strategy, and compatibility also exists between the strategy and the internal technologies.

Step 2

In their research Lawrence and Lorsch (1967) found that clearly defined and formal task segmentation or differentiation can contribute to the performance of the organization. Departmentalization may occur on the basis of business function, managerial function, technical process, similar tools or techniques, time, product, geographic location, or client served (Jelinkek, 1980). At this point in the development of the proposed organizational structure differentiation, segmentation or departmentation will be on the basis of managerial function. This method is frequently used and is often referenced in Air Force Manuals and Pamphlets. Air Force Systems Command Pamphlet 800-3 (1976:1) lists the following as "principal functional processes which may be accomplished during (system) acquisition:"

Program Control

Procurement

Engineering Management

Configuration Management

Test and Evaluation

Data Management

Manufacturing and Production Management

Integrated Logistics Support

Facilities Support/Civil Engineering

Training

Interface Management

During the interviews of 10 and 14 August, Lieutenant Colonel Molnar indicated that the following are the principal managerial functions that exist within CISPO:

Program Control

Procurement

Engineering Management

Configuration Management

Test and Evaluation

Integrated Logistics Support

Data Management

Manufacturing and Production Management

Step 3

Lieutenant Colonel Molnar indicated during the interviews of 10 and 14 August 1982 the various subenvironments or portions thereof that each of the managerial functions interacts with or is expected to interact with. Borrowing the environmental designations used in the classification of internal technologies, Figure 10 lists the appropriate combinations. In Figure 10 it can be seen that program control interacts with those governmental agencies that control and/or conduct the business associated with the acquisition system and PPBS (Reg. Agencies (PPBS)), the sources of money, manpower and office space within the Department of Defense (Supplier (Financial)), and all other programs within the DOD and ASD that compete for all resources (Competitor). Procurement interacts exclusively with the contractors (Supplier (Provisioning)). Engineering management engages those agencies of the federal government that deal primarily with the Mark XV's use in a noncombatant environment (Reg. Agencies (Other)), the using commands of the Air Force, Army, and Navy (Customers), and contractors (Supplier (Provisioning)), and those individuals that are advancing the technological state-of-the-art in the fields of communication, sensors, and recognition (Sci.-Tech.). Configuration management interacts with the contractors (Supplier (Provisioning)). Test and evaluation interacts with using commands of the military (Customers), the contractor (Supplier (Provisioning)), and the technical community to operationalize demands and verify performance. Manufacturing and production management exclusively engages the manufacturing division of the various contractors (Supplier (Provisioning)). Integrated logistics support interacts with the military users

Functional Division	Associated Subenvironment	Overall Environmental Assessment	Overall Technological Assessment
Program Control	Reg. Agencies (Acq. Sys/PPBS)	H	H
	Supplier (Financial)	H	H
	Competitor	M	L
Procurement	Supplier (Provisioning)	L	H
Engineering Management	Reg. Agencies (Other)	L[a]	L
	Customers	M	M
	Suppliers (Provisioning)	L	H
	Sci. Tech.	H	H
Configuration Management	Supplier (Provisioning)	L	H
Test and Evaluation	Customers	M	M
	Supplier (Provisioning)	L	H
	Sci. Tech.	H	H

Figure 10. Functional Division and Associated Subenvironments

[a]Originally Reg. Agencies were not scheduled. Subsequent review indicated Reg. Agencies (other) to be primarily noncomplex, routine, organized, direct with low and stable change rate.

Functional Division	Associated Subenvironment	Overall Environmental Assessment	Overall Technological Assessment
Manufacturing and Production Management	Supplier (Provisioning)	L	H
	Rég Agencies (Other)	L[a]	L
Integrated Logistics Support	Customers	M	M
	Supplier (Provisioning)	L	H
	Reg. Agencies (Acq. Sys/PPBS)	H	H
	Sci. Tech.	H	H
Data Management	Supplier (Provisioning)	L	H

Figure 10--Continued

(Customers), the contractors (Supplier (Provisioning)), those portions of the DOD involved with the system acquisition system and the PPBS (Reg. Agencies (PPBS)), and the scientific and technical communities (Sci.-Tech.). Finally, Data management interacts with the contractor (Supplier (Provisioning)).

Step 4

Burns and Stalker (1961) used the terms mechanistic and organic to characterize the two extremes of a continuum of organizational management. Their characterizations of the poles of the continuum contained several observations that were structural in nature. Those structural characteristics observed by Burns and Stalker (1961:119-125) are:

> [Mechanistic]
>
> The specialized differentiation of functional tasks into which the problems and tasks facing the concern as a whole are broken down.
>
> The abstract nature of each individual task, which is pursued with techniques and purposes more or less distinct from those of the concern as a whole; that is, the functionaries tend to pursue the technical improvement of means, rather than the accomplishment of the ends of the concern.
>
> The reconciliation, for each level in the hierarchy, of these distinct performances by the immediate superiors, who are also, in turn, responsible for seeing that each is relevant in his own special part of the main task.
>
> The precise definition of rights and obligations and technical methods attached to each functional role.
>
> Hierarchic structure of control, authority and communication.
>
> A tendency for interaction between members of the concern to be vertical, that is between superior and subordinate.
>
> A tendency for operations and working behavior to be governed by the instructions and decisions issued by superiors.

[Organic]

The contributive nature of special knowledge and experience to the common task of the concern.

The "realistic" nature of the individual task, which is seen as set by the total situation of the concern.

The adjustment and continual redefinition of individual tasks through interaction with others.

The shedding of "responsibility" as a limited field of rights, obligations and methods. (Problems may not be posted upwards, downwards or sideways as being someone else's responsibility.)

A network structure of control, authority, and communication. The sanctions which apply to the individual's conduct in his working role derive more from presumed community of interest with the rest of the working organization in the survival and growth of the firm, and less from a contractual relationship between himself and a nonpersonal corporation, represented for him by an immediate superior.

Omniscience no longer imputed to the head of the concern; knowledge about the technical or commercial nature of the here and now task may be located anywhere in the network; this location becoming the ad hoc centre of control authority and communication.

A lateral rather than a vertical direction of communication through the organization, communication between people of different rank, also resembling consultation rather than command.

A content of communication which consists of information and advice rather than instructions and decisions.

Organic systems are not hierarchical in the usual sense. The layering is based on the degree of expertise. The authority is given to (usually by consensus) and taken by whoever demonstrates the possession of expert knowledge. Because of the commitment of individuals to the working organization, evidence of separate formal and informal organizations becomes increasingly hard to find (Burns and Stalker, 1961).

A continuum of organizational structures corresponding to the Burns and Stalker (1961) continuum is presented in Figure 11. A review of Burns and Stalker (1961), Chandler (1962), Galbraith (1971), Lawrence and Lorsch (1967), Mintzberg (1979), Robey (1982), and Szilagyi (1981) reveals a lose consensus with respect to the sequence of organizational structures proposed in Figure 11. It should be noted that there are no clear or clean points of division between structural types. Figure 11 purposely shows areas of overlap among structural types since, in some instances, more than one structural type can provide sufficient effectiveness and efficiency for an organization. Since most complex organizations have multiple objectives they are difficult to classify as a whole using Figure 11 but subunits of this type of organization may be easily classified using this scheme.

Before discussing the mechanism used to couple the evaluations of the contingent factors of the "principle management functions of CISPO" and the appropriate organizational structure, four items need to be noted. First, since CISPO is in the very early stage of the acquisition cycle (pre-DSARC I), strategy initially defines an organization's internal technology (Ullrich and Wieland, 1980), and the internal technology appears to adequately represent a CISPO strategy, inclusion of that strategy as a contingent factor becomes redundant. Secondly, the classification matrix used to describe the external environment (Figure 1) has been divided into three

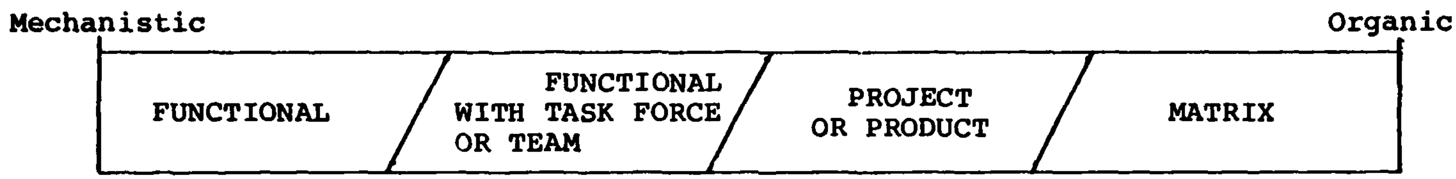

Figure 11. Continuum of Structural Types

sectors (Figure 12). The sector represented by "L" denotes those environmental characteristics that would imply applicability of Burns and Stalker's (1961) classification of mechanistic, while "H" implies the classification of organic, and "M" covers the area between the extremes. The third aspect refers to type of scales used in the classification and coupling schemes. All of these scales are ordinal in nature. These scales offer a measurement or rank of some attribute, but they offer no information on the distances between rankings. Finally, a review of the work of Lawrence and Lorsch (1967) and Woodward (1965) indicates that high, medium, or low values of either environment or technology will produce similar structural implications.

The mechanisms used to couple the evaluations of external environment, internal technology, and suitable organizational structure is presented in Figure 13. Matching of structure and contingent factors at the poles of the continuum is relatively straightforward. Overall ratings of low environment and technology would indicate a functional structure as appropriate; whereas, highly complex technology (H), and uncertain and unstable environment (H) indicates a matrix organization as being suitable (Galbraith, 1971; Szilagyi, 1981). Rank order of the intermediate combinations of environment and technology is established using the moment method presented in the appendix. Actual

A CORE TYPOLOGY OF ORGANIZATIONAL ENVIRONMENTS

		General characteristics															
		Noncomplex								Complex							
		Routine				Nonroutine				Routine				Nonroutine			
		Organized		Unorganized		Organized		Unorganized		Organized		Unorganized		Organized		Unorganized	
Movement		D	I	D	I	D	I	D	I	D	I	D	I	D	I	D	I
Low change rate	Stable	1															16
	Unstable		L						M						H		
High change rate	Stable																
	Unstable	49															64

*D=Direct I=Indirect

Figure 12. Environmental Sectors

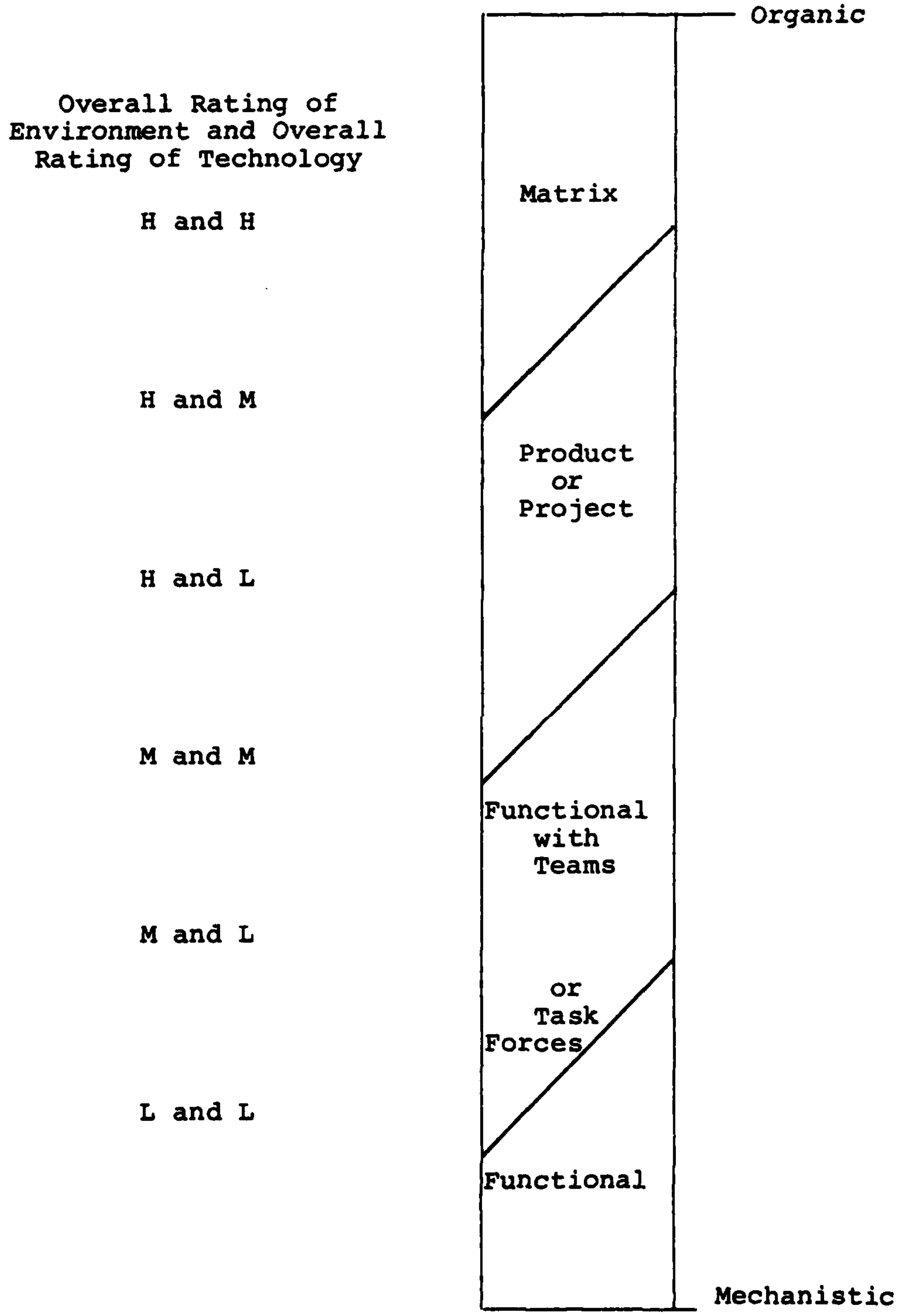

Figure 13. Relationship Between Contingent Factor Combinations and Structure Types

assignment of structural types to these intermediate combinations of technology and environment is subjective, but is made with respect to the observations reported by Burns and Stalker (1961), Chandler (1962), Galbraith (1977), Galbraith and Nathanson (1978), Lawrence and Lorsch (1967, 1972), Miles and Snow (1978), Szilagyi (1981), and Woodward (1965). For example, an organization or subunit within an organization that evaluates its external environment as "H" or high (i.e., a high degree of complexity and instability) and its internal technology as "L" or low (i.e., high predictability and low difficulty) may find that product type structures may be suitable. A second alternative would be a functional type structure that includes teams or task forces. It should be noted that an organization that evaluates its environment as "L" and its internal technology as "H" would find the same alternatives suitable. This transitive property is due to the moderated approach (no one contingent factor is dominant over another) taken in translation of the evaluations of contingent factors to a suitable organization structure.

The moment method used to establish rank order among the contingent factors can accommodate any number of contingent factors as well as relative weights between individual factors. These modifications are discussed in the appendix.

The suggested organizational structures for the segments (principal managerial functions) identified in step 2 are superimposed on the structural continuum (Figure 11) in Figure 14. Computations for each segement are contained in the appendix.

Both program control and integrated logistics support within CISPO may find either a project/product or matrix structure suitable for its operation at this point in time. An example of project/product structure is one where an individual or small group (provided the personnel are available) is assigned by the chief of the particular section (program control or integrated logistics support in this case) to perform the entire range of duties (i.e., for program control: estimating, budgeting, cost analysis, scheduling, planning, and forecasting) for a particular subprogram or task (Figure 15). Another suggestion provided by AFSCP 800-3 (1976) is to structure by product or output. Again, using program control as an example, the outputs of this office are of two types: one oriented toward providing information about the future and the other allowing discipline of the efforts of the entire program office (Figure 16). Program control and integrated logistic support may find a matrix structure to also be suitable. The matrix structure common to many organizations is one based on required projects and functional tasks

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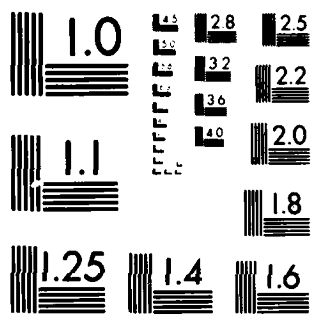

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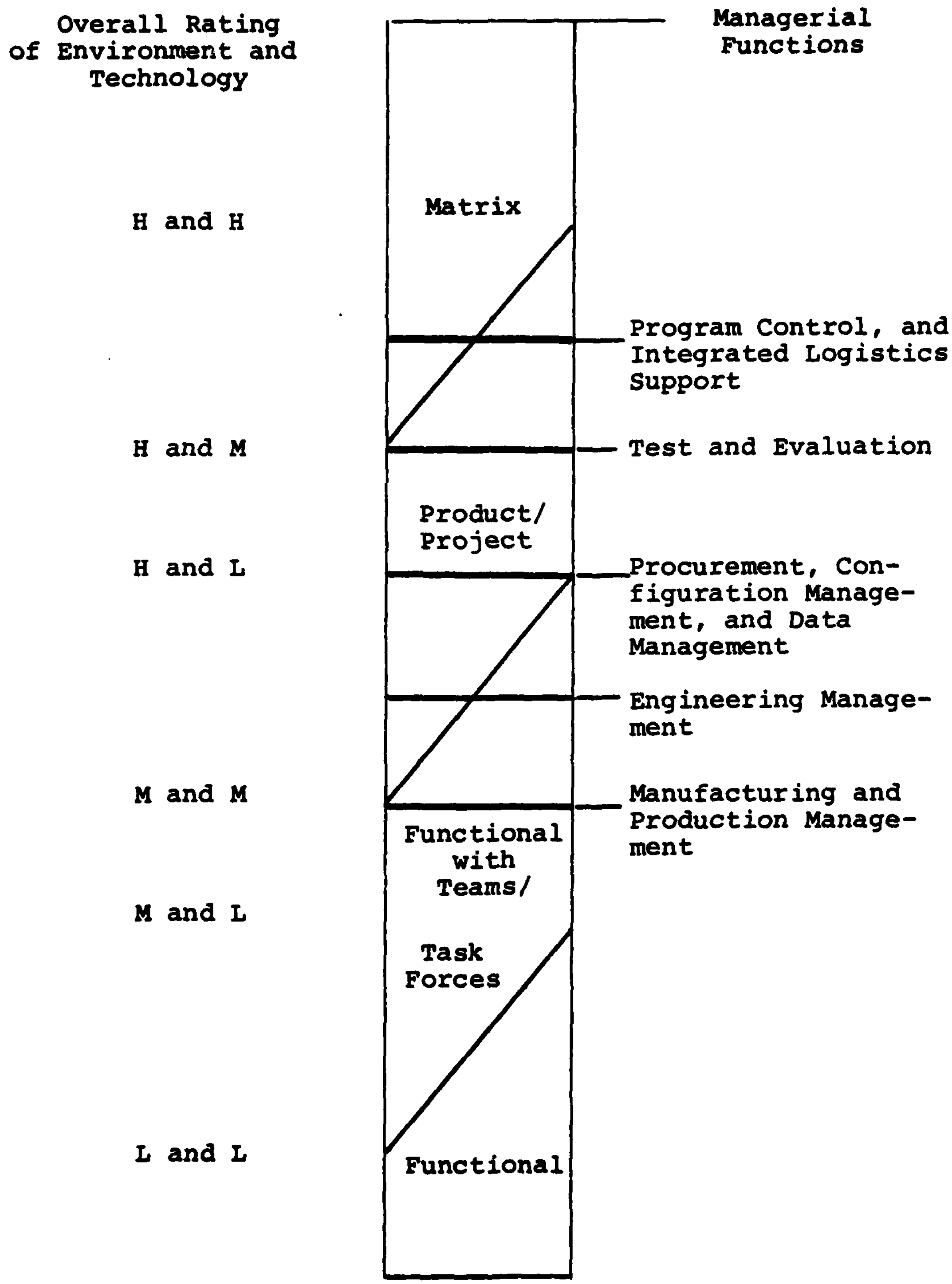

Figure 14. Structural Considerations for CISPO

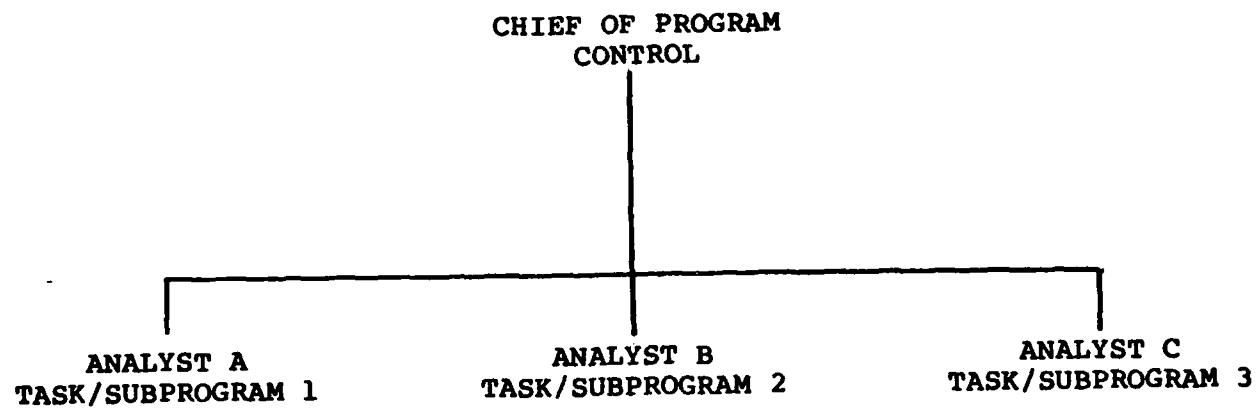

Figure 15. Program Control Structure by Project/Task (AFSCP 800-3, 1976:p.6-1)

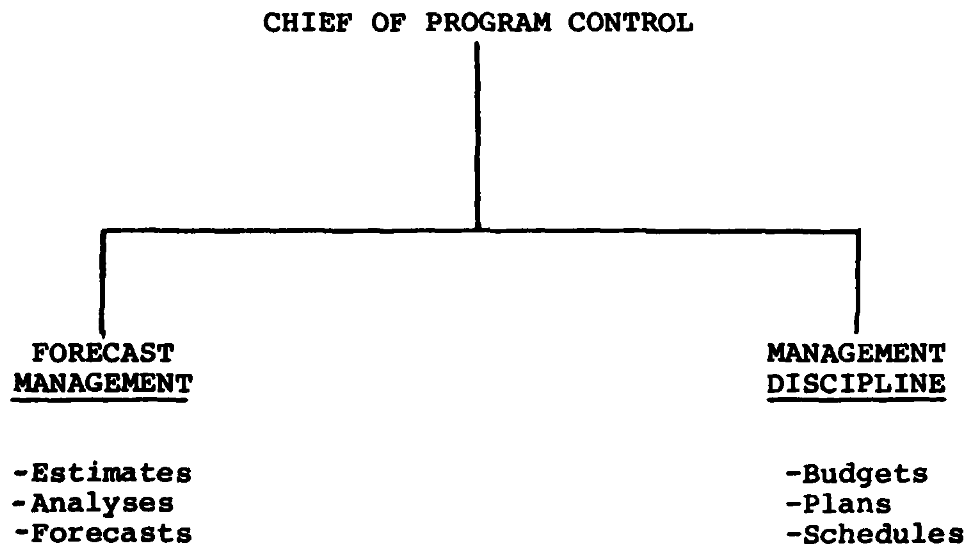

Figure 16. Program Control by Product/Output
(AFSCP 800-2, 1976:p.6-2)

(Galbraith, 1977). An example of the possible matrixing of the program control is shown in Figure 17.

As shown in Figure 14 the managerial functions of test and evaluation, procurement, configuration management, and data management may find the product/project structure suitable. Like the product/project configuration of program control, the structure of the aforementioned functions could be one where the section chief assigns the entire range of duties of the section to one individual for a particular subprogram or project (Figure 15). Using procurement as an example, a product/output structure based on contract type (i.e., R&D, support, production) is also a possibility (Figure 18).

Engineering management may find the previously discussed product/project structures suitable. Additionally, a functional structure using teams or task forces may also prove sufficient. A functional structure that utilizes teams/task forces incurs sufficient changes in either product or process that exsiting plans and directives don't cover the problem areas. Additionally, the head of each functional group doesn't have sufficient information about the problem or ramifications of possible solutions; hence, any decision about the problem is pushed up the hierarchy, usually overloading the information capability of the system. When this occurs an integrating mechanism (i.e., task force or team) can be formed. Teams are

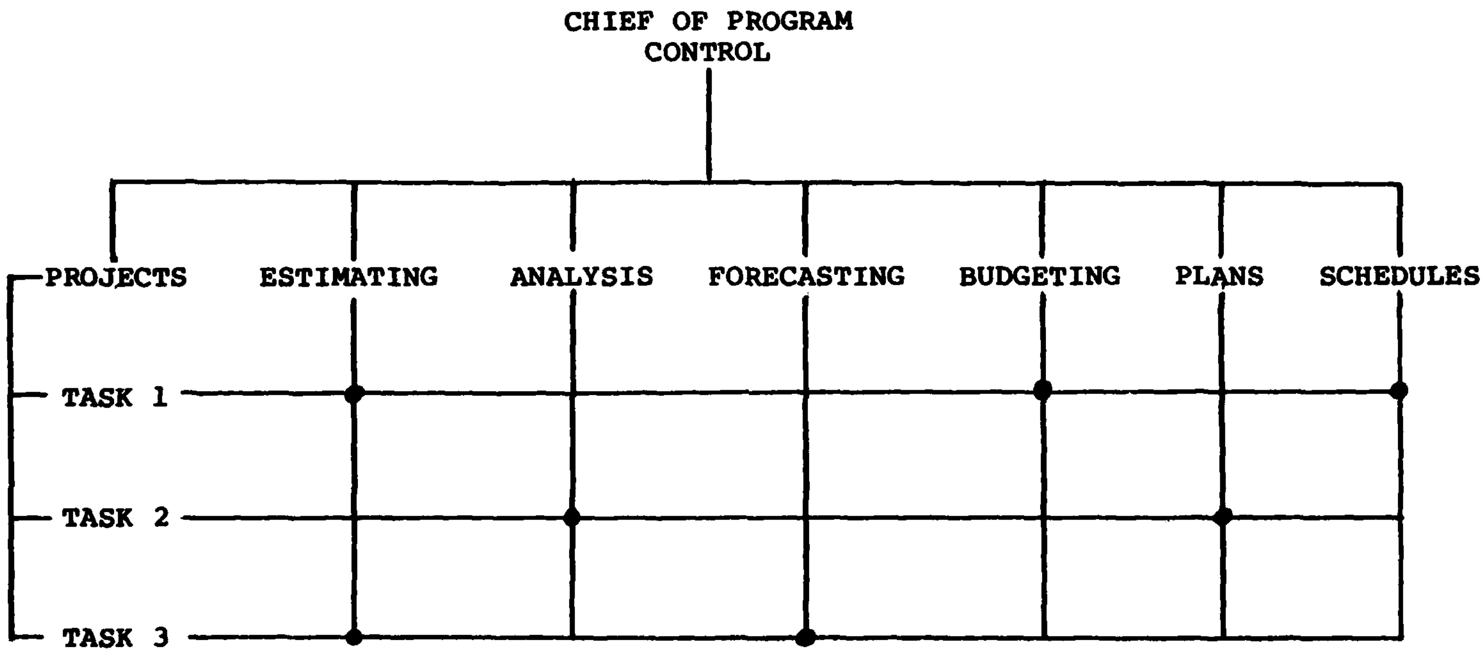

Figure 17. Program Control Using a Matrix Structure

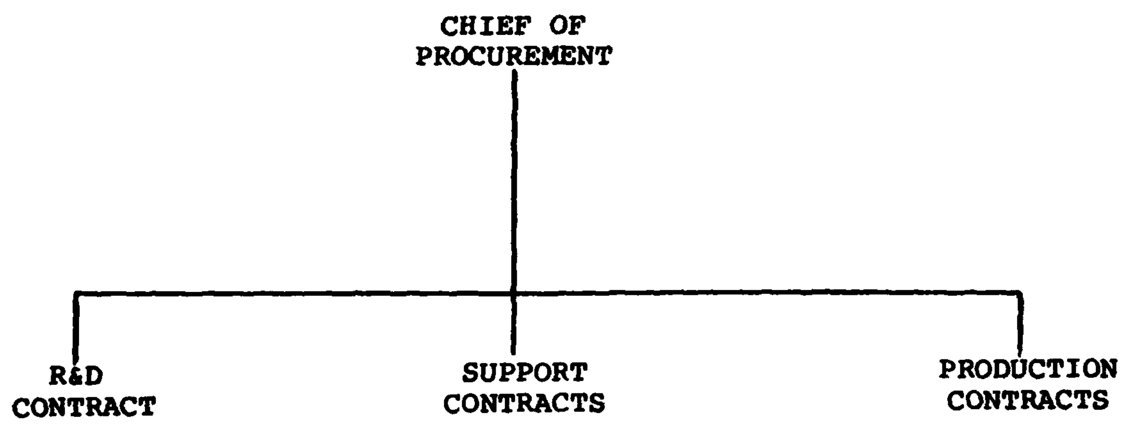

Figure 18. Procurement by Contract Type

usually more permanent than task forces. The team/task force is usually composed of the senior members of the specialties involved. Ideally, the recommendations of the team/task force are implemented solving the problem, and members return to their functional specialty (Galbraith, 1977).

Manufacturing and production management may also find a functional structure that uses task forces or teams to be suitable.

In summary, Figure 19 identifies the types of organizational structure that have been found to be suitable for the principal managerial functions of CISPO. These structures are based on an evaluation of the contingent factors of external environment, strategy and internal technology.

Step 5

The dynamics of the early stages (time prior to full-time development) of the systems acquisition process preclude most attempts to specify a structure for the segments (i.e., principal managerial functions) identified in step 2. While the moment technique for the organization as a whole indicates a project/product type structure, the specific arrangement of the functions is dependent on consideration of two additional factors. The first factor is the task or tasks assigned. These tasks may specify

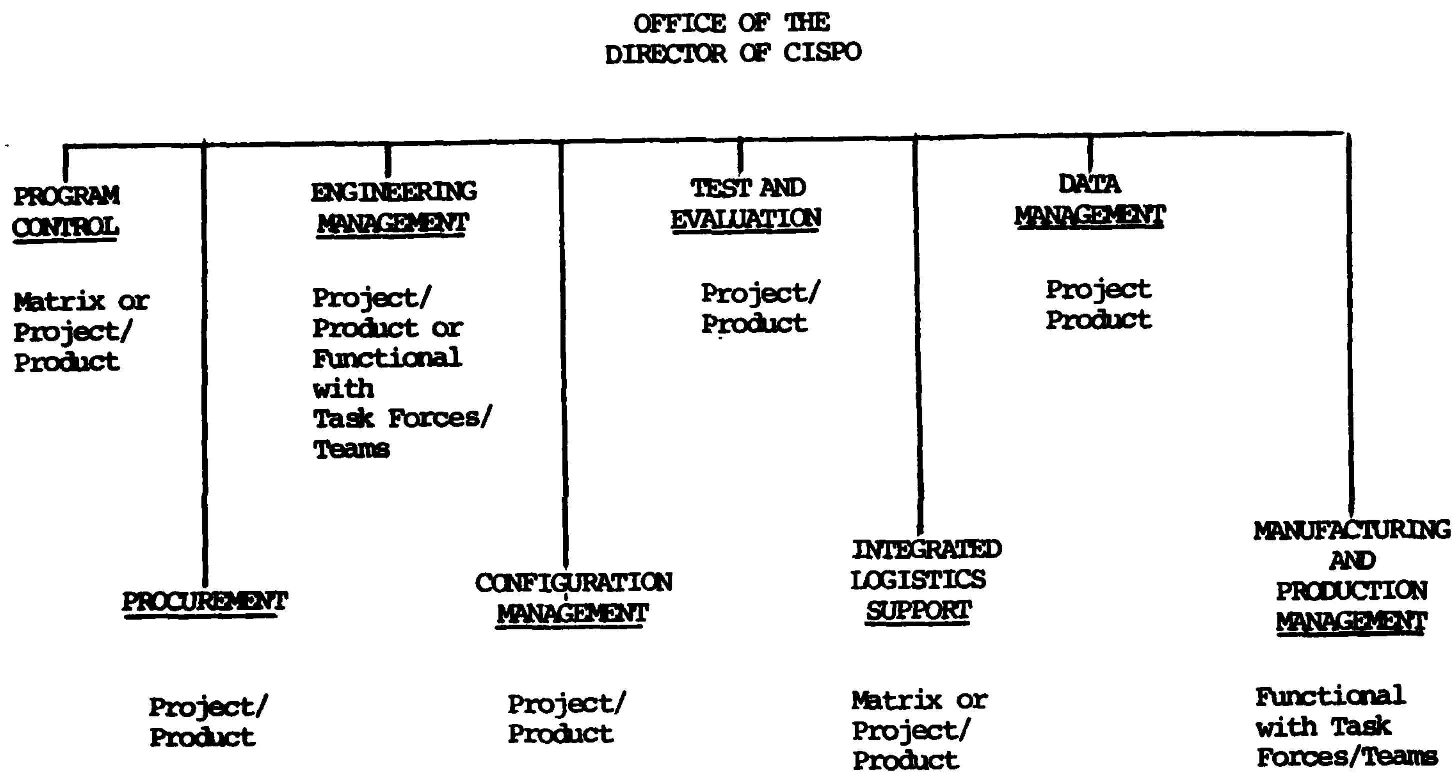

Figure 19. Structural Summary

the involved function and will also generate various interdependencies. Thompson (1967) has observed three types of interdependencies, pooled, sequential, and reciprocal (page 49). Each of these utilizes a particular coordination mechanism. Pooled interdependency can be achieved through standardization of operations procedures, sequential interpendency allows the use of planning to achieve coordination, and reciprocal interdependency requires mutual adjustment or feedback. According to Thompson (1967:65), these coordination mechanisms infer a technique for grouping functions. This technique localizes and makes

> . . . conditionally autonomous, first reciprocally interdependent positions, then sequentially interdependent ones, and finally grouping positions homogeneously to facilitate standardization.

Information about the tasks assigned CISPO and the resulting interdependencies was not gathered during the interviews with Lieutenant Colonel Molnar. The dynamic nature of this information may require frequent rearrangement of the organization at this level.

CHAPTER IV

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The purpose of this thesis was to attempt to identify a suitable organizational structure for the Combat Identification System Program Office (CISPO). The proposed structure was to be used in the initial evaluations of the structural needs of CISPO and was not intended to be an optimized structure. Current organizational concepts, specifically contingency theory, were used to underpin the development of the proposed organizational structure. Proponents of contingency theory (Lawrence and Lorsch, 1967; Kast and Rosenzweig, 1979; Szilagyi, 1981) state that there is no universal or best way to structure the organization and that each structure is dependent or contingent on the situation facing a particular organization. The dominant or contingent factors of external environment, strategy, and internal technology were used to describe the situation faced by CISPO. These factors were selected as the result of a review of the current lierature dealing with contingency theory and organizational design. The typology used to identify the individual subenvironments encountered by CISPO was taken from the work of Jurkovich (1974). Miles and Snow (1978) provided the scheme for classifying CISPO's strategy, and the work of Ovalle (1981) and Woodward (1965) provided sufficient definition of the internal technology to allow differentiation of the different types occurring within CISPO.

Information required for the proper evaluation of the selected contingent factors was provided through a series of interviews with Lieutenant Colonel Molnar, Deputy Director of CISPO, during July and August 1982.

The information specifying the external environment, strategy, and the internal technology of CISPO was inspected to assure a reasonable degree of compatibility between environment and strategy, and strategy and technology as a first step in the development of a proposed structure. Next, the work of CISPO was segmented on the basis of "principal managerial function" (i.e., procurement, test and evaluation, program control, etc.). The subenvironments that interacted with each of the managerial functions were identified next. The moment technique was used to establish a relationship between the quantification of the contingent factors as observed in CISPO and the structural implications of the contingent factors in general as established by Burns and Stalker (1961), Chandler (1961), Dalton, Lawrence, and Lorsch (1970), Lawrence and Lorsch (1967), Miles and Snow (1978), Perrow (1967), Thompson (1967), and Woodward (1965). This resulted in structural possibilities of the managerial functions that ranged from functional with task forces/teams to matrix. While the moment technique indicates a product/project structure for the system program office (SPO) as a whole, specific arrangement of the functions requires additional knowledge about the specific overall tasks immediately assigned to the SPO and the resultant interdependencies that develop. This requirement for additional information is generated by the dynamics of CISPO's environment. This data wasn't collected during the interviews with Lieutenant Colonel Molnar. Arrangements techniques proposed by Thompson (1967) were suggested as a possible starting point when the data becomes available.

Figure 19 presents the result or conclusion of this thesis. It proposes organizational structures of the principal managerial functions of CISPO that are based on contingency theory. While this thesis also established a broad classification of the structure of the functions, project/product, the lack of information about the immediate tasks and the resultant interdependencies prevents a more specific recommendation.

No claim can be made with respect to the <u>absolute</u> degree of effectiveness and efficiency inherent in the proposed structure. Some degree of economic efficiency is implicit in the work of many of the contingency theorists cited in this thesis (i.e., Lawrence and Lorsch (1967) and Woodward (1965)).

It is envisaged that the proposed structure will not be an end in itself, but that it will be modified and "fine tuned" through discussion subsequent to this thesis and will ultimately provide CISPO a viable and responsive organizational structure.

Recommendations for further study primarily revolve around the method used to aggregate the measures of contingent factors and the ability of that method to couple them to a specific structural type. Specifically, the ordinal scale of structural types (i.e., low environment and low technology being associated with a functional structure in the Air Force realm) requires empirical support, and the ability of the moment method to correctly place composite environments and technologies within the aforementioned scale of structural types needs statistical verification. Finally, establishment of a precise link between the contingent factors and performance, however measured, would allow maximum benefit to be derived from the structuring process.

APPENDIX

THE MOMENT METHOD

The moment method allows the aggregation of ordinal values assigned to the contingent factors. This method has its basis in engineering. Engineering computations of stress and deflection require aggregation of components (i.e., calculation of moments of inertia and centers of gravity) with respect to some reference point or plane.

Aggregation of values of contingent factors is analogous to the engineering example since combination of various contingent values with respect to a specific reference level is the desired outcome. Each contingent value has two characteristics. The first is magnitude and the second is the placement of the magnitude relative to some arbitrary reference. In the case of ordinal scales the exact dimensions associated with a magnitude and placement are irrelevant as long as rank order among items measured with the scale is maintained.

Turning back to the engineering example, the weight and the point, with respect to the reference, at which the weight can be assumed to act (i.e., computation of centers of gravity) for a single object is easy to ascertain. The determination of the point at which the weight can be assumed to act becomes more complex when multiple objects are involved. To determine the point at which multiple weights are considered to act, the product of each weight and its distance from some reference is formed. This sum is then divided by the sum of all the magnitudes. The number resulting from the division is the point, with respect to the reference, where the total weight can be assumed to act.

The point, with respect to a reference, where aggregated contingent value's acts is computed in a fashion identical to that used to compute the center of gravity in the engineering example. The magnitudes of the contingent values of high, medium, and low will be three, two, and one respectively, while the distance or position with respect to a reference will be three for high, two for medium, and one for low. Note that the rank order for both magnitude and placement has been maintained.

While this thesis uses only two contingent factors the moment technique is capable of handling an infinite number of factors since the summations of product of magnitude and placement or distance, and the summation of magnitudes are not limited by any kind of constraints. Although there is no weighting of the values associated with external environment or the internal technology in the case of CISPO, the capability to weight different contingent factors is easily achieved by multiplying the appropriate magnitudes by a given factor either prior to or during the multiplication of magnitude and distance.

Table A-1 contains the calculations of all possible combinations and rank order of values of two contingent

TABLE A-1

RANK ORDER OF POSSIBLE COMBINATIONS OF TWO CONTINGENT FACTORS

Values of Contingent Factors	Associated Magnitude (M)	Associated Placement (P)	MxP	Sum of M	Sum of MxP	Sum of MxP/ Sum of M
H	3	3	9			
H	3	3	9	6	18	3.00
H	3	3	9			
M	2	2	4	5	13	2.60
H	3	3	9			
L	1	1	1	4	10	2.50
M	2	2	4			
M	2	2	4	4	8	2.00
M	2	2	4			
L	1	1	1	3	5	1.67
L	1	1	1			
L	1	1	1	2	2	1.00

factors and these results are used in Figure 13. Table A-2 contains the aggregation of the contingent factors for each of the principal managerial functions (see Figure 10). The resulting rank order of each function and its associated structural type is shown in Figure 14. It should be remembered that the values in the column labeled "sum of MxP/sum of M" are used only to establish a rank order on the continuum of Figure 13.

TABLE A-2

AGGREGATION OF VALUE CONTINGENT FACTOR FOR PRINCIPAL MANAGERIAL FUNCTIONS

Managerial Function	Value of Contingent Factors (Fig 10)	Associated Magnitude (M)	Associated Placement (P)	MxP	Sum of M	Sum of MxP	Sum of MxP/ Sum of M
Program Control	H	3	3	9			
	H	3	3	9			
	H	3	3	9			
	H	3	3	9			
	M	2	2	4			
	L	1	1	1			
					15	41	2.73
Integrated Logistics Support	H	3	3	9			
	H	3	3	9			
	H	3	3	9			
	H	3	3	9			
	H	3	3	9			
	M	2	2	4			
	M	2	2	4			
	L	1	1	1			
					20	54	2.70
Test and Evaluation	H	3	3	9			
	H	3	3	9			
	H	3	3	9			
	M	2	2	4			
	M	2	2	4			
	L	1	1	1			
					14	36	2.57

TABLE A-2--Continued

Managerial Function	Value of Contingent Factors (Fig 10)	Associated Magnitude (M)	Associated Placement (P)	MxP	Sum of M	Sum of MxP	Sum of MxP/ Sum of M
Procurement, Configuration Management,	H	3	3	9			
Data	L	1	1	1			
Management					4	10	2.50
Engineering	H	3	3	9			
Management	H	3	3	9			
	H	3	3	9			
	M	2	2	4			
	M	2	2	4			
	L	1	1	1			
	L	1	1	1			
	L	1	1	1			
					16	38	2.38
Manufacturing	H	3	3	9			
and	L	1	1	1			
Production	L	1	1	1			
Management	L	1	1	1			
					6	12	2.00
CISPO OVERALL					83	211	2.54

SELECTED BIBLIOGRAPHY

REFERENCES CITED

Bobbitt, H. Randolph and Jeffrey D. Ford. "Decision-Maker Choice as a Determinant of Organizational Structure," Academy of Management Review, Vol. 5, No. 1 (1980), pp. 13-23.

Brabson, Colonel G. Dana. "Department of Defense Acquisition Improvement Program," Concepts, Autumn 1981, pp. 54-75.

Burns, T., and G. M. Stalker. The Management of Innovation. London: Tavistock, 1961.

Carlucci, Frank C. "Military Might, Industrial Muscle, Intellectual Yeast," Defense, October 1981, pp. 3-7.

Chandler, A. D. Strategy and Structure. Cambridge MA: MIT Press, 1962.

Child, John. "Organizational Structure, Environment and Performance: The Role in Strategic Choice," Sociology, January 1972.

Cleland, David I., and William R. King. Systems Analysis and Project Management. New York: McGraw-Hill Book Company, 1968.

Combat Identification System Program Office. Program Master Plan. ASD, Wright-Patterson AFB OH, 11 November 1980.

Connor, Patrick E. Organizations: Theory and Designs. Chicago: Science Research Associates, 1980.

Dalton, D. R., and others. "Organization, Structure, and Performance: A Critical Review," Academy of Management Review, Vol. 5, No. 1 (1980), pp. 49-64.

Dalton, Gene W., Paul R. Lawrence, and Jay W. Lorsch. Organizational Structure and Design. Homewood IL: Richard D. Irwin, Inc., and the Dorsey Press, 1970.

Defense Systems Management College. Management of Multinational Programs: A Handbook for Programs Involved in International Acquisition. Draft. Ft. Belvoir VA: Defense Systems Management College, April 1981.

Dill, William R. "Environment as an Influence on Managerial Autonomy," Administrative Science Quarterly, Vol. 2 (March 1958), pp. 409-443.

Drucker, Peter F. Management: Tasks, Responsibilities, Practices. New York: Harper and Row, 1974.

Duncan, Robert. "What is the Right Organizational Structure? Decision Tree Analysis Provides the Answer," Organizational Dynamics, Winter 1979, pp. 59-80.

Emery, F. E., and E. L. Trist. "The Causal Texture of Organizational Environment," Human Relations, Vol. 18 (1965), pp. 21-32.

Fayol, Henri. General and Industrial Management. Trans. by C. Storrs. London: Pitman Publishing Corporation, 1949.

Ford, Jeffrey D., and John W. Slocum, Jr. "Size, Technology, Environment and the Structure of Organizations," Academy of Management Review, October 1977, pp. 561-575.

Galbraith, Jay R. "Matrix Organizational Design," Business Horizons, No. 14 (1971), pp. 29-40.

________, and Daniel A. Nathanson. Strategy Implementation: The Role of Structure and Process. St. Paul: West Publishing Company, 1978.

Gillespie, David F., and Dennis S. Mileti. Technostructures and Interorganizational Relations. Lexington MA: D. C. Heath and Company, 1979.

Gulick, Luther, and Lyndall Urwick, eds. Papers on the Science of Administration. New York: Columbia University, 1937.

Higgins, James M. Organizational Policy and Strategic Management. Hinsdale IL: Dryden Press, 1979.

Hrebiniak, Lawrence G. Complex Organizations. St. Paul: West Publishing Company, 1978.

Hunt, Raymond G. "Technology and Organization," Academy of Management Journal, Vol. 13 (1970), pp. 235-252.

________ and Janet P. Near. "On the Technology Connection: Conceptual and Empirical Choice Points." Working paper. Buffalo: State University of New York, 1980.

Hutchinson, John G. Management Strategy and Tactics. New York: Holt, Rinehart and Winston, Inc., 1971.

Jelinek, Mariann. "Organizational Structure: The Basic Conformations," in Mariann Jelinek, Joseph A. Litterer and Raymond E. Miles, eds., Organizations by Design: Theory and Practice. Plano TX: Business Publications, Inc., 1981.

________, Joseph A. Litterer, and Raymond E. Miles. Organizations by Design: Theory and Practice. Plano TX: Business Publications, Inc., 1981.

Jurkovich, Ray. "A Core Typology of Organizational Environments," Administrative Science Quarterly, September 1974, pp. 380-394.

Kast, Fremont E., and James E. Rosenzweig. Organization and Management: A Systems and Contingency Approach. New York: McGraw-Hill Book Company, 1979.

Kepner, Charles H., and Benjamin B. Tregoe. The Rational Manager. New York: McGraw-Hill Book Company, 1965.

Lawrence, Paul R., and Jay W. Lorsch. Organization and Environment: Managing Differentiation and Integration. Boston: Harvard University Press, 1967.

________. Organization Planning: Cases and Concepts. Homewood IL: Richard D. Irwin, Inc., and the Dorsey Press, 1972.

Magnusen, Karl O. "Technology and Organizational Differentiation: A Field Study of Manufacturing Corporations." Ph.D. dissertation, University of Wisconsin, Madison, 1970.

March, James G., and Herbert A. Simon. Organizations. New York: John Wiley and Sons, Inc., 1958.

Miles, Raymond E., and Charles C. Snow. Organizational Strategy, Structure and Process. New York: McGraw-Hill Book Company, 1978.

Mitzberg, Henry. The Structuring of Organizations. Englewood Cliffs NJ: Prentice-Hall, Inc., 1979.

Molnar, Lieutenant Colonel Michael, USAF. Deputy Director, Combat Identification System Program, ASD, Wright-Patterson AFB OH. Personal interviews conducted intermittently from 2 July 1982 to 14 August 1982.

Oppendahl, Captain P. E., USN, and Colonel H. R. Passi, USN. "Managing Less Than Major Joint Programs," The Defense Systems Management Review, Spring 1979, pp. 19-29.

Ovalle, Nestor K. "Organizational Technology, Control and Performance: A Study of the Relationships at the Subunit Level." Ph.D. dissertation, Graduate School of Business, Indiana University, 1981.

Paine, Frank T., and William Naumes. Organizational Strategy and Policy. Philadelphia: W. B. Saunders Company, 1975.

Perrow, Charles. "A Framework for the Comparative Analysis of Organizations," American Sociological Review, Vol. 22, No. 2 (April 1967), pp. 194-208.

________. Organizational Analysis: A Sociological View. Monterey CA: Brooks/Cole Publishing Company, 1970.

Puritano, Vincent. "Getting Ourselves Together on Systems Acquisition," Defense, October 1981, pp. 9-19.

Rendine, Major Michael J. "Meeting the Challenge of Multinational Programs," Concepts, Spring 1981, pp. 119-126.

Robey, Daniel. Designing Organizations: A Macro Perspective. Homewood IL: Richard D. Irwin, Inc., 1982.

Runkle, Captain M. T., and Captain M. L. Smith. "Systems Acquisition Guide." Unpublished research report, unnumbered, Air Command and Staff College, Maxwell AFB AL, 1978.

Scott, William G., and Terrence R. Mitchell. Organization Theory: A Structural and Behavioral Analysis. Homewood IL: Richard P. Irwin, Inc., 1976.

Szilagyi, Andrew D. Management and Performance. Santa Monica CA: Goodyear Publishing Company, Inc., 1981.

Taylor, Fredrick W. The Principles of Scientific Management. New York: Harper and Brothers, 1911.

________. Shop Management. New York: Harper and Brothers, 1919.

Thompson, A. A., and A. J. Strickland. Strategy Formulation and Implementation: Tasks of the General Manager. Dallas TX: Business Publications, Inc., 1980.

Thompson, J. D. Organizations in Action. New York: McGraw-Hill, Inc., 1967.

Ullrich, Robert A., and George F. Wieland. Organization Theory and Design. Homewood IL: Richard D. Irwin, Inc., 1980.

U.S. Department of Defense. A Guide for Program Management. AFSC Pamphlet 800-3. Washington: Government Printing Office, 9 April 1976.

________. Major Systems Acquisition. DOD Directive 5000.1. Washington: Government Printing Office, 29 March 1982.

________. Major Systems Acquisition Procedures. DOD Directive 5000.2. Washington: Government Printing Office, 19 March 1980.

________. "Tri-Service Charter and Management and Administration of the United States Identification Systems Program." Washington: Government Printing Office, 26 September 1980.

Wall, W. C., Jr. "Representation and Responsibility in a Tri-Service Program," The Defense Systems Management Review, Spring 1979, pp. 30-33.

Weber, M. The Theory of Social and Economic Organizations. Trans. by A. M. Henderson and T. Parsons. New York: Oxford University Press, 1947.

Wolf, William B., ed. Management: Readings Towards a General Theory. Belmont CA: Wadsworth Publishing Company, Inc., 1964.

Woodward, Joan. Industrial Organization: Theory and Practice. London: Oxford University Press, 1965.

________. "Technology, Material Control, and Organizational Behavior Models," ed. A. R. Negandhi and J. P. Schwitter. Kent OH: Kent State University Press, 1970.

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